UNEXPECTEDLY EXPECTING:
UNINTENDED FERTILITY, NONMARITAL CONCEPTIONS, AND WELL-BEING AMONG PARENTS AND CHILDREN

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UNINTENDED FERTILITY, NONMARITAL CONCEPTIONS, AND WELL-BEING AMONG PARENTS AND CHILDREN

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This dissertation is comprised of three papers that examine the implications of unintended fertility and nonmarital conceptions on adult and child well-being.

The first paper examines the role of pregnancy intentions on parents' psychological well-being. Using two waves of data from the National Survey of Families and Households (NSFH) (n = 825 women, n = 889 men), this study finds that unintended births are associated with increased depressive symptoms among fathers, and decreased happiness among mothers, even after accounting for relationship status and measures of psychological well-being prior to the birth.

The second paper examines the relationship between pregnancy intentions and several metrics of child well-being over the life course (ages 0-30). This study uses longitudinal data from the NLSY79 (n = 22,247 person-year observations) and propensity score techniques to address limitations of prior research. Results indicate that children resulting from unintended pregnancies had a less emotionally supportive home environment compared to children resulting from intended pregnancies, even after accounting for the mother's marital status at birth and other characteristics associated with selection into unintended childbearing. Children resulting from unintended pregnancies also experienced more depressive symptoms as adults, which suggests that unintended birth may have long term consequences.

The third paper examines the implications of nonmarital conceptions and subsequent

patterns of relationship formation for child well-being. Postconception cohabitations, which are formed after the conception of a child but prior to birth, are an increasingly common response to nonmarital pregnancies, yet little is known about how children fare in this type of family structure. Using data from the Fragile Families Child and Well-Being Study (n = 8,218 person-year observations), this study found that children born to postconception cohabitors fared slightly better than children born to unpartnered parents, worse than those born to pre- and postconception married parents, and similarly to those born to preconception cohabitors in terms of economic resources, father involvement, and family stability. Despite these disparities, they had similar behavior problems and cognitive test scores compared to children in other family structures. Results suggest that the increase in postconception cohabitation is unlikely to be associated with consequences for child development, but may be linked to family instability and limited economic resources.

BIOGRAPHICAL SKETCH

Jessica Houston Su earned a Bachelor of Arts in Sociology from Dartmouth College in 2002. Prior to graduate school, she worked for the Joblessness and Urban Poverty Research Program, a social policy research program directed by William Julius Wilson at Harvard's Kennedy School of Government. Her research interests include family demography, social inequality and stratification, employment, and child development. She will join the Sociology department at the University at Buffalo as an assistant professor in January 2014.

To Rick and Nora

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CHAPTER 1: INTRODUCTION

This dissertation is comprised of three papers that examine the implications of unintended fertility and nonmarital conceptions on adult and child well-being. Marriage and childbearing are becoming increasingly decoupled, and more parents are choosing to have children outside of marriage (Smock and Greenland 2010). As norms about childbearing have shifted, marriage has become increasingly deinstitutionalized and cohabitation has become a more acceptable alternative to marriage (Cherlin 2004). Recent estimates suggest that almost half of births to cohabiting couples and a third of births to unmarried, non-cohabiting couples were intended at the time of conception (Mosher, Jones, and Abma 2012). As a result, the traditional focus on family structure as a central determinant of child well-being may not provide a complete picture of the contemporary childbearing context.

The first two papers in this dissertation focus on the effects of unintended fertility on parents and children. These papers acknowledge the unique role of pregnancy intentions as part of the changing context of childbearing, and disentangle the independent effects of pregnancy intentions and marital status on parental and child well-being. Both studies provide evidence that pregnancy intentions are related to metrics of parental and child well-being, and are distinct from the estimated effect of marital status at birth. Results suggest that unintended births are associated with decreased happiness among mothers and increased depressive symptoms among fathers. Results also indicate that unintended children had a less emotionally supportive home environment compared to intended children, even after accounting for the mother's marital status at birth and other characteristics associated with selection into unintended childbearing. They also experienced more depressive symptoms as adults, which suggests that unintended birth is linked to long term consequences. Taken together, these studies provide evidence that

pregnancy intentions are a salient consideration in evaluating parental and child well-being.

The third paper in this dissertation focuses on shifting norms about the responses to nonmarital conceptions and the implications for child well-being. The prevalence of postconception, pre-birth (i.e., "shotgun") marriage has decreased dramatically over time, and there has been significant growth in postconception cohabitation, reflecting changing norms and expectations about nonmarital childbearing. This study examines the relationship between postconception cohabitation and child well-being to evaluate the implications of this trend. Results suggest that the increase in postconception cohabitation is unlikely to be associated with consequences for child development, but may be linked to family instability and limited economic resources.

CHAPTER 2: PREGNANCY INTENTIONS AND PARENTS' PSYCHOLOGICAL WELL-BEING

Empirical research finds that parents experience more depression and stress relative to their childless counterparts (Evenson and Simon 2005; McLanahan and Adams 1987). Yet these studies largely overlook the role of pregnancy intentions —whether a birth was considered intended (planned at the time of conception) or unintended (unwanted or mistimed at conception). Unintended births have been linked to a host of negative outcomes for children and families (Brown and Eisenberg 1995), but the effect on parents' psychological well-being is less understood. The current study extends prior research by examining the effects of pregnancy intentions on parents' psychological well-being using nationally-representative longitudinal data.

Demographic, social, and cultural trends in childbearing make pregnancy intentions a salient consideration for understanding the transition parenthood. Despite the increasingly voluntary nature of parenthood, the United States has a surprisingly high rate of unintended pregnancy. In 2001, nearly half of all pregnancies were unintended, and 22% of these unintended pregnancies resulted in live births (Finer and Henshaw 2006). At the same time, adults are having more *planned* children outside of marriage. Estimates from the 2002 National Survey of Family Growth suggest that nearly half of nonmarital births are planned (49% among cohabitors, 31% among never married) (Chandra et al. 2005). Although prior research sometimes relies on marital status as a proxy for pregnancy intentions, inferring that nonmarital births are unintended, this assumption is problematic in light of these trends (Musick 2002). This study acknowledges the unique role of pregnancy intentions as part of the changing context of parenthood, and disentangles the effects of pregnancy intentions and union status.

Prior research and contributions of current study

This study is situated at the intersection of two bodies of literature. One stream of research finds that parenthood is generally associated with poor adult well-being, but largely overlooks the role of pregnancy intentions (e.g., Evenson and Simon 2005; McLanahan and Adams 1987). Another stream of research finds that unintended births have negative effects on children's health, behavior, and development, but pays scant attention to adult well-being (e.g., Baydar 1995; Brown and Eisenberg 1995). There are two exceptions, which provide some consideration of how pregnancy intentions affect adult well-being. Barber, Axinn, and Thornton (1999) found that unwanted childbearing is associated with increased maternal depression relative to mothers with intended births, which in turn compromises mother-child relationships. Shifting the focus to residential first-time fathers, Bronte-Tinkew, Scott, Horowitz, and Lilja (2009) found that unintended births are associated with increased paternal depression compared to fathers with intended births, which is in turn associated with less support and communication with the baby's mother. Although these two studies primarily focused on child outcomes, they provide some evidence that unintended births are associated with poorer adult well-being.

The current study addresses two methodological limitations in prior research on pregnancy intentions and parental well-being. First, prior studies rely on cross-sectional data or do not have a measure of well-being prior to becoming a parent, which leaves estimates vulnerable to selection bias. Second, prior studies estimate the effects of unwanted or unintended births relative to intended births. This is a valid comparison, but it does not disentangle changes in well-being due to pregnancy intentions from general changes in well-being experienced among the broader population over time. The current study leverages nationally-representative longitudinal data to account for the parent's state of well-being prior to having children, similar to the approach used in Nomaguchi and Milkie's (2003) study of parenthood and adult well-

being. It also draws on a comparison group of childless adults to assess changes in well-being among parents relative to their childless counterparts.

This study further contributes to the literature by examining gender differences in the effect of pregnancy intentions. Although Barber et al. (1999) and Bronte-Tinkew et al. (2009) considered the effects of pregnancy intentions on mothers and fathers, respectively, these studies cannot directly address differences between men and women. The current study also examines the mechanisms that link pregnancy intentions to parental well-being. While prior research has conceptualized parental well-being as a mediating factor that explains parenting and child outcomes, it has paid less attention to the reasons why parents experience poorer well-being as a result of unintended births.

Conceptual framework and hypotheses

This study draws on life course theory as a conceptual framework. Life course theory emphasizes the importance of time, context, and meaning in understanding family transitions, such as moving out of a parent's house, getting married, or becoming a parent (Bengtson and Allen 1993). Within this framework, the social meaning of a transition is influenced by the appropriateness of its timing—whether it is considered early, on time, or late. Norms and expectations create a socially prescribed order to life events, and a mistimed milestone may be associated with negative consequences (Elder and Shanahan 2006). As such, the general hypothesis for this study is that unintended births will be associated with poor psychological well-being among parents (Hypothesis 1).

An alternative explanation is that associations between unintended births and psychological well-being are spurious due to selection bias. In other words, there might be parental characteristics that are associated with both unintended births and well-being, and the

relationship is not causal. For example, adults who are depressed prior to having children might be more likely to experience an unintended birth, and in turn report higher levels of depression thereafter. There are other potentially confounding factors that are associated with both pregnancy intentions and well-being. Unintended pregnancies are more common among disadvantaged groups, such as younger parents, racial or ethnic minorities, single or cohabiting parents, and parents with low education or low income (Finer & Henshaw, 2006). This study will address concerns about selection bias by leveraging longitudinal data, controlling for confounding factors, and carefully constructing the sample.

Life course theory also provides a theoretical foundation for hypotheses about the specific mechanisms that link pregnancy intentions to parental well-being (see Figure 2.1). First, life course theory posits that inappropriately timed milestones have negative consequences in part because they are associated with less social support (Elder and Shanahan 2006). This leads to the hypothesis that unintended births will be associated with poorer well-being because the parents have fewer social resources (Hypothesis 2). Prior research supports this hypothesis; although new parents report higher levels of social integration in general (Nomaguchi and Milkie 2003), many parents with unintended births receive less social support (Brown and Eisenberg 1995).

Self-efficacy, the belief that one has control over one's life, might be affected by an inappropriately timed milestone. Having an unintended birth may heighten feelings of powerlessness because it is, by definition, an undesired event that occurred despite efforts to prevent it (Barber, Axinn, and Thornton 1999). In turn, feelings of powerlessness are strong determinants of anxiety, depression, and distress (Mirowsky and Ross 1986), particularly among parents with unintended births (Hypothesis 3).

Financial strain might also account for the relationship between pregnancy intentions and

well-being. Raising a child incurs enormous financial costs, and economic strain can be a significant stressor for mothers and fathers (Ross and Huber 1985). An unintended birth can disrupt education or career plans in addition to creating unexpected financial burdens (Abma and Mott 1994). Therefore, I hypothesize that unintended births are associated with financial strain, which is in turn associated with poor psychological well-being (Hypothesis 4).

--Figure 2.1 here--

This study also examines whether the effect of pregnancy intentions varies by the parent's gender. A priori, it is unclear whether we should expect mothers or fathers to be more adversely affected by an unintended birth. Instead, we might expect their well-being to be affected through different pathways. Prior research suggests that mothers tend to experience more parenting stress than fathers, perhaps because they are more likely to be the primary caregivers (Nomaguchi and Milkie 2003; Ross and Van Willigen 1996). Mothers find little institutional support to balance parenthood and employment, and sacrifice leisure time for parenting activities (Hochschild and Machung 2003; Sayer, Bianchi, and Robinson 2004). Given the time-intensive nature of parenting, mothers of young children are more likely to experience diminished social interaction compared to fathers (Munch, Smith-Lovin, and McPherson 1997). An unintended birth might compound these stresses and result in poorer well-being among mothers.

Fathers might be more likely to experience psychological consequences from unintended births due to increased financial strain and reduced self-efficacy. While women are more likely to be primary caregivers, men are more often the family breadwinners. Fathers might have difficulty meeting the unexpected financial demands associated with an unintended birth, and the inability to fulfill the breadwinner role can be deleterious to psychological well-being (Schindler 2010). Men also report that they have less control over decisions about the resolution of

unintended pregnancies (i.e., abortion, adoption, or parenting) (Johnson and Williams 2005), which could compromise their sense of self-efficacy. Moreover, women who feel most ill-equipped to raise a child might be more likely to opt for abortion or adoption in the event of an unintended pregnancy. Thus, an unintended birth is more often the result of purposive decision-making by the mother. Taken together, this prior research suggests that mothers will be more likely to experience poorer well-being as a result of diminished social support, while fathers will experience poorer well-being as a result of diminished self-efficacy and increased financial strain (Hypothesis 5).

METHOD

Data and Sample. This study uses data from the first two waves of the National Survey of Families and Households (NSFH), collected in 1987-88 (Wave 1) and 1992-94 (Wave 2) (Bumpass and Sweet 1997). The NSFH has a national probability sample with oversamples of minorities and single-parent families, families with step-children, cohabiting couples and recently married persons. All results are weighted to account for the complex sampling design. Information about adult well-being was collected only among main respondents, so this analysis does not draw on data from spouses.

One drawback of the NSFH is that the data are somewhat dated, and may not accurately represent contemporary family life. Nonetheless, the data are well-suited to answer the questions set out in this study, and more recent studies do not provide the necessary metrics of pregnancy intentions and parental well-being. The basic analyses in this study require longitudinal data, a nationally representative sample, measures of pregnancy intentions, and measures of parental well-being that are collected before and after the first birth. Three public data sets meet these criteria: the NSFH, the National Longitudinal Survey of Youth (NLSY), and the National

Longitudinal Study of Adolescent Health (Add Health). The NLSY collects measures of well-being only at age 40, which makes these data well-suited to research about long-term well-being but not the transition to parenthood. The most recent wave of Add Health data was collected when the respondents were 24-32 years old, which might over-represent younger parents.

I create a nonequivalent control group sample by selecting respondents who were age 17-44 and childless at Wave 1. This sample restriction ultimately creates a "control" group (those who remain childless at Wave 2) and a "treatment" group (those who have children at Wave 2). Although this sample selection is not a true experimental design because the treatment is not randomly assigned, it is a good option for evaluating the effects of unintended births using non-experimental data. The treatment group has a measure of well-being prior to becoming parents, which allows me to isolate the effect of intentions from general changes in well-being. The control group of childless adults allows me to determine whether changes in well-being are associated with parenthood or with temporal changes in well-being in the population.

Although the childless group provides an important point of comparison, it is not without drawbacks. Namely, heterogeneity within this group could confound the comparison. This group might include people who are involuntarily childless, will eventually become parents, or had an unintended pregnancy that was terminated. Among those childless at Wave 2, about half indicated they would like to have a child sometime in the future, 30% said they would not like to have a child in the future, and about 6% indicated that either they or their spouse were sterilized (the remaining did not know or refused to answer). Despite these concerns, the comparison group allows us to examine the effect of an unintended *birth* on well-being.

This sample selection also allows me to focus on the initial transition into parenthood. The birth of a first child represents a distinct change in life stage and might have a different impact on

well-being than subsequent births. Indeed, research finds that first births improve mother's subjective well-being, while subsequent births reduce it (Kohler, Behrman, and Skytthe 2005). Limiting the sample to first births avoids confounding the results with heterogeneity among unintended births.

The NSFH interviewed 13,007 respondents at Wave 1. The analytic sample includes men and women who were childless and age 17-44 at Wave 1 and completed a Wave 2 interview. I removed respondents who already had a child at Wave 1 (removed 9,532, 73%), did not have a valid response about births since Wave 1 (removed 462, 4%), had step-children (removed 129, 1%), or had adopted children (removed 53, < 1%). I removed respondents who were not age 17-44 at Wave 1 (removed 787, 6%). Finally, I removed respondents who did not report their child's age (removed 2, < 1%), whose child had died (removed 5, < 1%), or were missing values for either one of the dependent variables (removed 323, 2%). The resulting analytic sample is n = 1,714 (13% of total sample at Wave 1), of which n = 825 are women and n = 889 are men.

Measures

Dependent variables. The analyses include two measures representing different dimensions of psychological well-being: depressive symptoms and general happiness. Although these concepts are related, having both a positive and negative measure of well-being helps to avoid bias. For example, measuring only negative outcomes might over-emphasize the negative effects of parenthood and pregnancy intentions (Nomaguchi and Milkie 2003).

Depressive symptoms is a 12-item scale derived from the Center for Epidemiological Studies Depression scale (CES-D) (Radloff 1977), and is measured at Wave 1 and Wave 2. Respondents were asked how many days in the previous week they: (a) felt bothered by things that don't usually bother you; (b) did not feel like eating; (c) felt that you could not shake off the blues; (d)

had trouble keeping your mind on what you were doing; (e) felt depressed; felt that everything you did was an effort; (f) felt fearful; (g) slept restlessly; (h) talked less than usual; (i) felt lonely; (j) felt sad; and (k) felt you could not get going. The items were summed (range: 0-84; $\alpha = 0.91$).

General happiness is a single-item measure that asks, "Taking things all together, how would you say things are these days?" and ranges from 1 (*very unhappy*) to 7 (*very happy*). Reliability studies indicate that this global measure of happiness is sensitive to life circumstances (Ehrhardt, Saris, and Veenhoven 2000). Further, it has been used successfully in other studies of parenthood and well-being (Kohler, Behrman, and Skytthe 2005).

Independent variables. Pregnancy intentions are measured with dummy variables that indicate whether the respondent's first birth was *intended* or *unintended* (omitted category is childless). This information is collected using the Wave 2 fertility history module, which asks respondents to provide a retrospective report of their fertility behavior. Respondents are first asked, "Just before [your] pregnancy began, did you yourself want to have a baby at SOME time?" Respondents who answer no are classified as having an "unwanted" pregnancy. Respondents who answer yes are asked, "Did that pregnancy occur sooner than you wanted, later than you wanted, or at about the right time?" Respondents who answer "sooner than you wanted" are classified as having a "mistimed" pregnancy. Respondents who answer that it happened at "about the right time" or "later than [they] wanted" are classified as having an "intended" pregnancy. In this study, 6% of the sample reports a mistimed birth and 4% reports an unwanted birth. I combine unwanted and mistimed births into a single category of unintended birth due to low sample sizes. Descriptive statistics reveal few statistically significant differences between parents with mistimed and unwanted births, perhaps due to the low statistical power associated with small sample sizes (results available on request).

Although measures of pregnancy intentions are common in demographic research, their reliability is often debated. One concern is that they may suffer from retrospective reporting bias (Sable 1999). Parents who carry an unintended pregnancy to term may be less likely to later report that their child was not planned regardless of how they felt when the child was conceived. Further, the intention variables might over-simplify the concept of pregnancy planning by measuring it as a binary state; unintended pregnancies are often characterized by ambivalence rather than unequivocally planned or unintended (Edin et al. 2007). Despite these concerns, these measures have been used in prior studies and are related to child outcomes in predictable ways (Brown and Eisenberg 1995). Further, research has found that retrospective accounts of pregnancy intentions do not bias statistical estimates of the effects of unintended fertility (Joyce, Kaestner, and Korenman 2002). The sample of new parents in this analysis may limit retrospective bias associated with a longer time lapse between the actual birth and data collection.

Control Variables. I adjust for several background characteristics that may be related to both pregnancy intentions and well-being. A dummy variable indicates whether the respondent is female or male (1 = female, 0 = male). To assess whether the effect of pregnancy intentions varies by sex, I interact the variables for intended and unintended births with the female dummy variable. I control for race (non-White, with non-Hispanic White as referent), respondent's age (measured in years), and educational attainment at Wave 1 (dummy variables representing less than high school, high school graduate, and some college, with college graduate or more education as the referent). Employment at Wave 1 is categorized according to hours worked in the past week; the categories are unemployed (0 hours, referent), part-time employment (1-34 hours), and full-time employment (35 or more hours). Respondents who indicated their work

hours varied were re-coded to the hours worked in the previous week. I also include a variable for family income measured at Wave 1, reported in thousands of dollars. Union status at Wave 2 is measured with dummy variables for married, cohabiting, and separated/divorced/widowed respondents (single/never married is the referent).

Mediating Variables. Social support is represented with two different measures: attendance at religious services and social interaction. *Attendance at religious services* represents access to social networks that can provide support to new parents. This measure also serves as a proxy for religious faith, and gives some indication of ideological orientations toward childbearing and pregnancy intentions. Respondents report how often they attended religious services at both waves; responses were coded to indicate attendance per month (range: 0-60.8). *Social interaction* is a 3-item scale that measures how often the respondent had social interaction with (a) relatives, (b) neighbors, or (c) friends who live outside of the neighborhood in the past year, and is measured at both waves (0 = *never*, 1 = *several times a year*, 2 = *about once a month*, 3 = *about once a week*, 4 = *several times a week*). Items were summed; the social interaction scale ranges from 0-12. Although these measures capture the frequency of social interaction, they do not necessarily capture the extent to which an adult can rely on his or her social network for support.

Self- efficacy is a single-item measure that is collected at both waves; respondents were asked how much they agreed or disagreed with the statement "I have always felt pretty sure my life would work out the way I wanted it to." The question uses a 5-point agreement scale, which was reverse-coded so higher values indicate higher levels of self-efficacy. This item has also been used in other studies of adult well-being to represent self-efficacy (McLanahan and Adams 1989; Nomaguchi and Milkie 2003).

Financial strain is a single item measured only in Wave 2 that asks respondents "How often

do you worry that your total family income will not be enough to meet your family's expenses and bills?" Higher values represent more financial strain (1 = *never*, 2 = *hardly ever*, 3 = *once in a while*, 4 = *often*, 5 = *almost all the time*). This measure may gauge financial burden more accurately than traditional proxies such as income, which do not reflect net cash flow.

Seventy three percent of the sample had complete data for all variables included in the analysis, and missing data are multiply imputed by chained equations (Rubin 1987). Respondents with missing data for the dependent variables were included in the imputation, but are excluded from the analytic sample (von Hippel 2007). I generated 25 imputed datasets to ensure stable estimates (Johnson and Young 2011), but the models are not sensitive to the number of imputations (results not shown).

Descriptive statistics are shown in Table 2.1. At Wave 2, 71% remained childless, 19% had an intended birth, and 10% had an unintended birth. The sample is primarily White (80%) and well-educated, with 60% having some college or more education.

Analytic Strategy. Selection bias and omitted variable bias are chief concerns in this analysis. One concern is that individuals may select into pregnancy planning on the basis of their well-being (i.e., selection on the dependent variable). Table 2.1 demonstrates that parents who have unintended births report lower Wave 1 happiness than parents with intended births ($p < .05$). Another concern is that individuals may select into unintended births based on fixed characteristics. As shown in Table 2.1, parents with intended births are more likely to be White, older, and more highly educated than parents with unintended births ($p < .05$).

To address concerns about selection on the dependent variable, I estimate ordinary least squares (OLS) regressions using the regressor variable method. This approach estimates the effect of pregnancy intentions on well-being at Wave 2 while adjusting for the measurement of

well-being at Wave 1, prior to having children. This model is represented in equation (1), where Y_{it} is the well-being outcome of respondent *i* at Wave 2, $X_{1,it}$ represents the categorical pregnancy intentions variable, Y_{it-1} is the Wave 1 measure of the dependent variable, Z_{i1} is a vector of control variables, and e_{it} is the error term. Standard errors are adjusted to account for the fact that the Wave 1 and Wave 2 measures of well-being are not independent.

$$Y_{it} = \alpha + \beta_1 X_{1,it} + \beta_2 Y_{it-1} + Z_{i1}\gamma + e_{it} \qquad (1)$$

I also use regressor variable OLS models to test mediation using the three-step method outlined by Baron & Kenny (1986). Evidence for mediation is indicated if (a) the mediator is associated with pregnancy intentions, (b) well-being is associated with pregnancy intentions, and (c) the coefficient for the effect of pregnancy intentions on well-being is attenuated when including the mediator in the model. Following the logic of the regressor variable method, these models adjust for the Wave 1 measure of the mediator when possible. This provides additional assurance that the temporal order of events is maintained for mediation analysis. Financial strain is only measured at Wave 2, so no pre-test measure is available. Nonetheless, it is plausible that financial strain is not a static characteristic and is influenced by the birth of a child. The models also control for household income at Wave 1, which provides some additional assurance that the effect of financial strain at Wave 2 is a result of pregnancy intentions.

To test the sensitivity of the regressor variable model, I also estimate change score and fixed effect models. The change score model is represented in equation (2). Here, the dependent variable is the change in well-being between Wave 1 and Wave 2. Instead of using the Wave 1 measure of well-being as a control variable, it is incorporated into the dependent variable.

$$Y_{it} - Y_{it-1} = \alpha + \beta_1 X_{1,it} + Z_{i1}\gamma + e_{it} \quad (2)$$

The regressor variable and change score models make different assumptions about the

trajectory of well-being for the treatment and control groups (see Morgan and Winship 2007, pp. 252-262). The change score method assumes that the difference in expected well-being for the treatment and control groups will remain constant over time in the absence of the treatment, while the regressor variable method assumes that differences will shrink. There are only two waves of data so these models are just identified, and I cannot use the data to determine which model is more appropriate. In general, the regressor variable model is preferable to a change score model if selection into pregnancy intentions is based on the dependent variable, while the change score model is preferable if selection is based on fixed characteristics (Allison 1990; Morgan and Winship 2007). Both methods have drawbacks; the regressor variable method may under-adjust for prior differences, and the change score method is susceptible to bias due to measurement error (Allison 1990).

Taken together, the regressor variable and change score models address some concerns about selection bias. Nonetheless, there are some remaining concerns. The analyses cannot account for other life events that might also impact well-being, such as residential relocation, job loss, or deaths. They also do not adjust for changes in education or union status over time, or other unobservable time-invariant characteristics that may bias the results. I address some of these concerns by estimating fixed effects models, which estimate a within-subject effect and therefore account for unobservable time-invariant characteristics that may be associated with both pregnancy intentions and well-being (see equation (3)).

$$Y_{it} - Y_{it-1} = \alpha_i + \beta_1(X_{1,it} - X_{1,\,it-1}) + (Z_{it-1} - Z_{it})^* \gamma + e_t - e_{t-1} \quad (3)$$

Results from the change score and fixed effects models are presented in Appendix Table 2.1. These models provide additional support for the findings from the regressor variable models, so I will focus on the regressor variable models in the following results section.

RESULTS

Table 2.2 presents the results from models predicting depressive symptoms and happiness. Because these models include interaction terms between gender and pregnancy intentions, we can examine six key groups: childless males, childless females, fathers with intended births, mothers with intended births, fathers with unintended births, and mothers with unintended births. The interactions make the interpretation of coefficients slightly less straightforward. The coefficient for intended birth represents the mean difference in well-being for childless males and fathers with intended births. Similarly, the coefficient for unintended birth is the difference in well-being between childless males and fathers with unintended births. The coefficient for female represents the mean difference in psychological well-being between childless females and childless males. The estimated difference in well-being between childless females and mothers with intended births is the sum of the intended birth coefficient and the female X intended coefficient. The estimated difference in well-being between childless females and mothers with unintended births is the sum of the unintended birth coefficient and the female X unintended coefficient.

I formally test for statistically significant differences in well-being among the six groups of interest. Some of these contrasts are tested with the coefficients and significance statistics presented in the tables, such as the differences between childless men and fathers with unintended or intended births. I also performed post-hoc Wald tests to test simple and composite linear hypotheses about model parameters. In other words, I use these tests to determine whether there are statistically significant differences between fathers with intended and unintended births, childless women and mothers with intended births, childless women and mothers with unintended births, and mothers with intended and unintended births. Other contrasts require

model specifications with varying omitted categories (results not shown). I re-estimated the models, first omitting the intended birth category and then omitting the unintended birth category to formally test whether there are statistically significant differences in well-being between mothers and fathers with intended births and unintended births, respectively.

I will first focus on the results predicting depressive symptoms in Table 2.2. The results suggest that fathers with unintended births experienced more depressive symptoms than childless males, even after adjusting for a series of control variables and the father's Wave 1 measure of depressive symptoms (b = 4.72, p < .05). According to post-hoc tests (not shown in table), mothers with intended and unintended births experienced a similar level of depressive symptoms compared to childless women. Childless females had significantly more depressive symptoms than childless males overall (b = 2.96, p < .01). The effect of unintended birth on depressive symptoms varied by gender, as evidenced by the statistically significant coefficient on the female X unintended coefficient (b = -6.21, p < .05), but the effect of intended birth did not.

Shifting focus to the models predicting happiness, the results provide evidence that mothers with unintended births experienced declines in happiness relative to childless women. This coefficient is calculated by adding the coefficient for unintended birth, -0.07, to the coefficient for the female X unintended interaction, -0.39 (b = -0.46, p < .05). Statistical significance was assessed using post-hoc tests (not shown in table).

Figure 2.2 plots the estimated conditional mean depressive symptoms and happiness for a respondent with average sample characteristics (average age, White, college degree, average income, full-time employment, married, average lagged dependent variable (depressive symptoms or happiness at Wave 1)). These results illustrate the findings from Table 2.2.

Mediation Analysis. The models presented thus far provide evidence for poorer well-being

among parents with unintended births, which leads to the next research question: what explains the increase in depressive symptoms among fathers with unintended births, and the decrease in happiness among mothers with unintended births? I examine the effects of social support, self-efficacy, and financial strain to explore the specific mechanisms of well-being. The hypothesized pathway is that pregnancy intentions influence these mediators, and that these mediators are in turn related to psychological well-being.

Having satisfied the first step of mediation analysis—demonstrating that unintended births are associated with poorer well-being—the next step is to determine whether unintended births are associated with the hypothesized mediators. Results from this analysis (not shown but available by request) suggest that unintended births were associated with declines in Wave 2 self-efficacy and increased financial strain among fathers. Among mothers, unintended births were associated with increased financial strain. Religious attendance and social interaction were not associated with unintended birth among mothers or fathers. Therefore, the mediation analysis proceeds with self-efficacy and financial strain as hypothesized mediators for fathers, and financial strain as a hypothesized mediator for mothers.

The final step of mediation analysis is to determine whether the hypothesized mediators attenuate the relationship between unintended birth and psychological well-being. Results in Table 2.3 provide evidence for weak to moderate mediation. Among fathers, controlling for self-efficacy reduced the effect of unintended birth on depressive symptoms by 24%, but the coefficient remained marginally significant ($b = 4.72$, $p < .05$ in Table 2.2 (without self-efficacy mediator); $b = 3.60$, $p < .10$ in Table 2.3 (with self-efficacy mediator)). Controlling for financial strain similarly attenuated the coefficient by 26% ($b = 3.51$, $p < .10$ in Table 2.3 (with financial strain mediator)). Among mothers, controlling for financial strain reduced the effect of

unintended birth on happiness by 33%, although the coefficient remained marginally significant (coefficient for mothers with unintended births is the sum of the unintended coefficient and the female X unintended interaction coefficient; b = -0.46, p < .05 from Table 2.2 (without financial strain mediator), b = -0.31, p < .10 in Table 2.3 (with financial strain mediator)). In sum, self-efficacy and financial strain partially explained the link between unintended birth and parents' psychological well-being.

DISCUSSION

Extant research suggests that parents are more depressed and stressed than their childless counterparts, but the role of pregnancy intentions is largely absent from the discussion. Pregnancy intentions are an important consideration given the high rate of unintended pregnancy in the US and high rates of planned childbearing outside of marriage. Although prior research sometimes infers pregnancy intentions from marital status by assuming that nonmarital births are unintended, demographic trends make this assumption problematic. This study therefore extends prior research by directly examining pregnancy intentions, and yields three central conclusions.

First, the results of this study suggest that pregnancy intentions are a relevant factor for parental well-being. Consistent with life course theory and this study's first hypothesis, unintended births were associated with poorer well-being for both mothers and fathers. These findings persist even after adjusting for union status and the parents' measure of well-being prior to having their first child, which diminishes concerns about selection bias. Estimates that do not distinguish parents by their pregnancy intention status suggest that mothers and fathers experienced poorer well-being than childless adults, in general (results available on request). This finding is consistent with prior research, but it obscures heterogeneity among parents. Moreover, this suggests that parents with unintended births are driving estimates of poor well-

being among parents overall. This study therefore extends prior research that overlooks the role of pregnancy intentions, and suggests that it is an important concept for future research.

Second, this study illustrates gender differences in the relationship between pregnancy intentions and psychological well-being. Results suggest that the effect of unintended birth on depressive symptoms varies by gender. Moreover, fathers with unintended births experienced more negative effects in terms of increased depressive symptoms, while mothers with unintended births experienced fewer positive effects in terms of happiness. This is a subtle distinction, but suggests that fathers with unintended births are more at risk of clinical signs of distress. The majority of research on pregnancy intentions focuses on mothers, but increased attention on fathers is warranted.

Third, this study finds that self-efficacy and financial strain partially mediated the relationship between unintended birth and poorer well-being, providing moderate support for Hypotheses 3 and 4. Men with unintended births experienced decreased self-efficacy and increased financial strain, which helped to explain their higher depressive symptoms and provides partial support for Hypothesis 5. Financial strain partially mediated the relationship between pregnancy intentions and poorer well-being for both men and women. This might be related to the fact that parents incur unexpected costs when they have an unintended birth. In addition, prior research indicates that fathers who considered abortion are less likely to provide financial support (Waller and Bitler 2008), which likely increases financial strain on the mother. Furthermore, unintended births are concentrated among disadvantaged populations, such as minorities, women with low education, and single mothers, who have fewer resources and more economic instability that is not captured with traditional measures of income, education, and employment.

I find no support for the hypothesis that social support, measured in terms of attendance at religious services or frequency of social interaction, mediates the relationship between well-being and pregnancy intentions (Hypothesis 2). This is generally consistent with recent research that found no effect of religious attendance on marital satisfaction among parents (Dew and Wilcox 2011). Parents with intended births experienced more social interaction, which is consistent with prior research among parents overall (Nomaguchi and Milkie 2003). Nonetheless, parents with unintended births did not experience diminished social support.

Although the results of this study are relatively robust (see Appendix Table 2.1 for a comparison of results across various models), there are some important limitations. The sample selection and analytic approach have attempted to isolate the effect of pregnancy intentions on parental well-being and diminish concerns about selection bias, but it is nearly impossible to determine a causal relationship without experimental data. There is only weak to moderate evidence of mediation, which suggests there are other possibilities for future research.

This analysis provides some key insights into the effects of pregnancy intentions, but some questions remain unanswered and represent avenues for future research. For example, it is possible that pregnancy intentions have varying effects by race, ethnicity, or socioeconomic status, but small sample sizes preclude subgroup analysis in this study. It is unclear whether the deleterious effects of pregnancy intentions would be amplified or diminished among disadvantaged groups. On the one hand, the fact that unintended childbearing is concentrated among disadvantaged populations and is associated with poor psychological well-being is particularly concerning. Low-income parents with unintended births are limited in the emotional, economic, and social resources they can confer to their children. Limited resources might increase financial strain, hamper parenting quality, and contribute to the diverging destinies of

children from different social classes (McLanahan 2004).

On the other hand, Edin and Kefalas (2005) posit that the opportunity costs of having an unintended or nonmarital birth are relatively low for low-income women given their limited educational and employment prospects. Within this context, an unintended birth does not necessarily disrupt educational or career trajectories and may not be associated with poor well-being. Unfortunately, the NSFH does not have measures of educational or career aspirations among parents so I cannot test this hypothesis within the context of this study. Qualitative research among low-income parents has also found that mothers and fathers with ambivalently planned or unintended births experience great satisfaction from parenthood (Augustine, Nelson, and Edin 2009; Edin and Kefalas 2005). Parents in these studies reported that children gave them a sense of hope and purpose in life, and some even claimed that their children saved them from self-destructive behavior. Future research should consider how the effects of pregnancy intentions vary across different populations.

This study cannot address the persistence of pregnancy intention effects over time and at different stages of the life course. Although the NSFH conducted a third wave in 2001-2002, the follow-up sample excludes a key portion of the childless sample analyzed in this study. This study also does not address the extent to which a couple's agreement or disagreement about pregnancy intentions affects parental well-being. Both of these issues represent avenues for future pregnancy intention research.

Despite these open questions, this study can inform future policy interventions. Programs directly targeted at parents with unintended births are unlikely to be successful because it is difficult to identify the population. Efforts should therefore focus on preventing unintended pregnancies and improving conditions for all parents. To address issues of self-efficacy,

programs should encourage men to take an active role in contraception to prevent unintended pregnancies. On a broader level, policies should shore up support for all parents to ease financial strain and difficulties balancing work and parenthood. For example, Jane Waldfogel (2001) proposes a package of universal paid parental leave for 10 months, child care subsidies, and early childhood monetary benefits that would support mothers and fathers. This package would make the transition to parenthood easier for all new parents, but especially those with unintended births, who might have fewer resources to make accommodations for child care.

In conclusion, this study facilitates a deeper understanding of the transition to parenthood and parental well-being by considering the role of pregnancy intentions. This focus reflects contemporary patterns of childbearing and family formation, which are characterized by high rates of unintended pregnancy as well as planned childbearing outside of marriage. Future research on parenthood should take pregnancy intentions into consideration, avoid conflating pregnancy intentions with union status or other characteristics, and give equal attention to mothers and fathers.

Figure 2.1. Hypothesized Pathways and Mediators

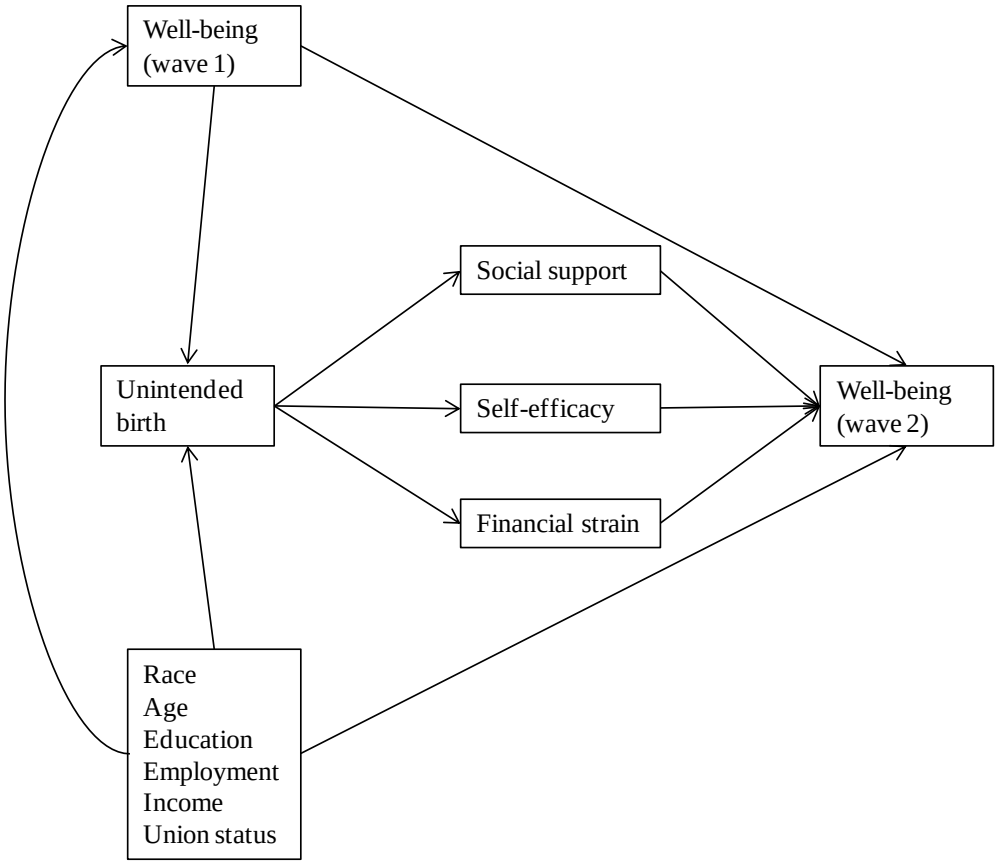


Table 2.1. *Means and Standard Deviations on Key Variables, by Parental Status and Pregnancy Intentions at Wave 2 (N = 1,714)*

	Total		Remained Childless		Intended Birth		Unintended Birth	
Variable	*M* or %	*(SD)*	*M* or %	*(SD)*	*M* or %	*(SD)*	*M* or %	*(SD)*
Measured at Wave 1								
Female	0.42		0.41		0.47		0.43	
Male	0.58		0.59		0.53		0.57	
White	0.80		0.81		0.83		0.73	
Non-White	0.20		0.19		0.17		0.27	
Less than high school	0.08		0.06		0.08		0.16	
High school/GED	0.32		0.29		0.37		0.40	
Some college	0.35		0.39		0.23		0.32	
College/graduate degree	0.25		0.25		0.32		0.12	
Unemployed	0.18		0.19		0.09		0.25	
Part time work	0.15		0.16		0.11		0.11	
Full time work	0.68		0.65		0.81		0.64	
Household income (*M*, in thousands)	21.31	(35.03)	18.59	(27.63)	34.73	(56.07)	15.59	(22.52)
Depressive symptoms (*M*, range = 0-84)[a]	15.39	(15.89)	15.28	(15.73)	14.43	(15.24)	17.83	(17.81)
Happiness (*M*, range = 1-7)	5.42	(1.24)	5.33	(1.26)	5.77	(1.11)	5.43	(1.21)
Religious attendance (*M*, range = 0-60.8)	1.78	(2.97)	1.69	(2.78)	2.07	(3.43)	1.87	(3.25)
Social interaction (*M*, range = 0-12)	5.69	(2.39)	5.57	(2.37)	5.67	(2.28)	6.55	(2.58)
Self-efficacy (*M*, range = 1-5)	3.60	(0.96)	3.58	(0.98)	3.78	(0.84)	3.47	(1.01)
Measured at Wave 2								
Remained childless	0.71		–		–		–	
Intended birth	0.19		–		–		–	
Unintended birth	0.10		–		–		–	
Respondent's age (*M*, in years)	31.59	(6.18)	32.06	(6.63)	31.22	(4.75)	29.05	(4.40)
Single	0.33		0.45		0.03		0.13	
Married	0.48		0.36		0.84		0.66	
Separated, divorced, widowed	0.07		0.08		0.07		0.06	
Cohabiting	0.11		0.12		0.06		0.16	
Depressive symptoms (*M*, range = 0-84)[a]	12.39	(13.44)	12.24	(13.26)	11.82	(12.92)	14.41	(15.31)
Happiness (*M*, range = 1-7)	5.42	(1.22)	5.38	(1.23)	5.59	(1.15)	5.39	(1.18)
Religious attendance (*M*, range = 0-60.8)	1.63	(2.79)	1.51	(2.66)	2.08	(3.01)	1.60	(3.12)
Social interaction (*M*, range = 0-12)	5.96	(2.06)	5.83	(2.03)	6.15	(1.95)	6.51	(2.36)
Self-efficacy (*M*, range = 1-5)	3.68	(0.97)	3.69	(0.98)	3.70	(0.90)	3.53	(1.02)
Financial Strain (*M*, range = 1-5)	2.96	(1.12)	2.84	(1.11)	3.17	(1.11)	3.37	(1.05)
N	1,714		1,122		413		179	

Note: All means are weighted by sampling weights that account for probability of selection, interview nonresponse, and the population distribution. Number of cases (*N*) are unweighted.

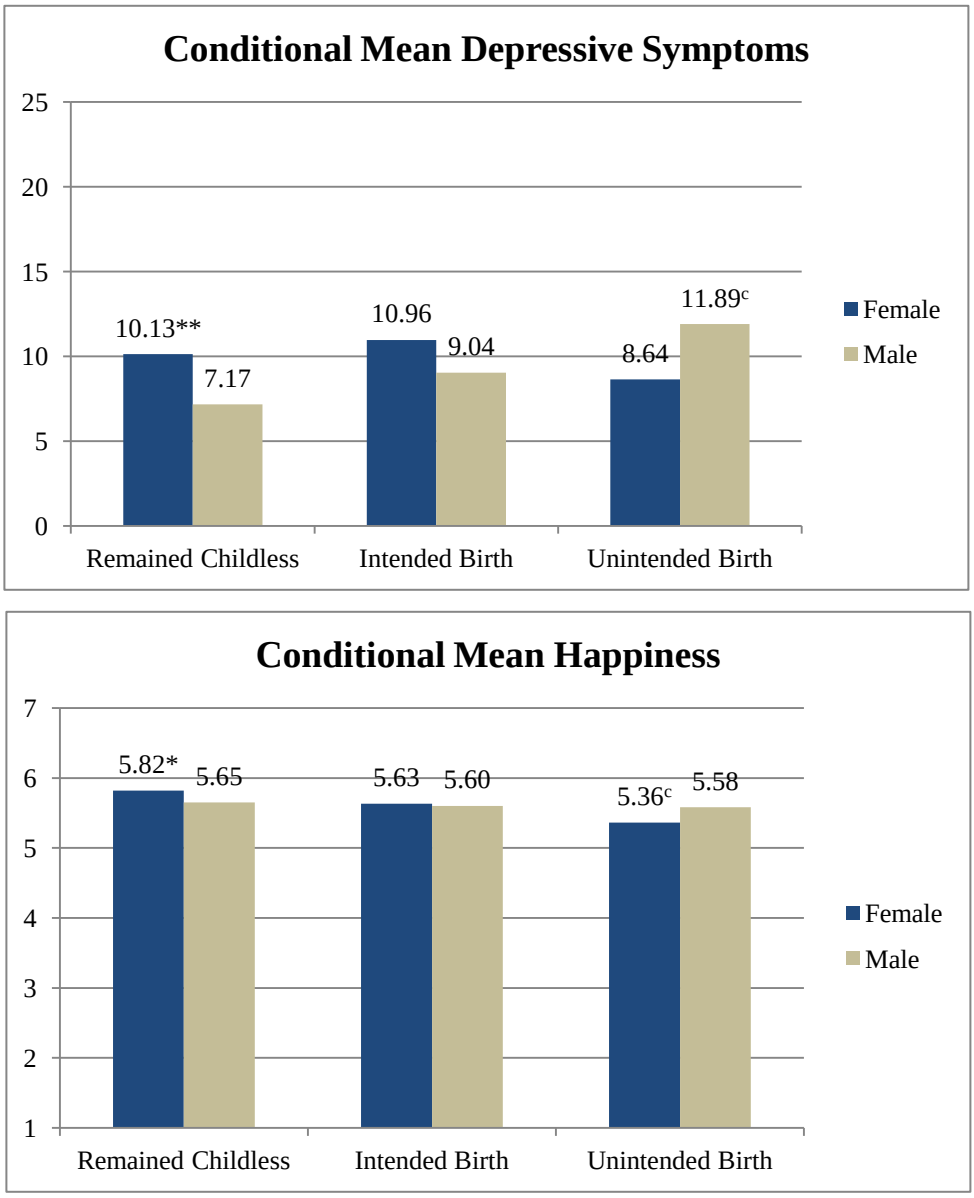
[a] From the Center for Epidemiological Studies Depression scale

Table 2.2. *Results from Regressor Variable Models Predicting Depressive Symptoms and Happiness (*N= 1,714)

	Depressive Symptoms		Happiness	
Variable	*B*	*(SE B)*	*B*	*(SE B)*
Intended birth	1.87	(1.30)	-0.05	(0.12)
Unintended birth	4.72*	(1.95)	-0.07	(0.16)
Female	2.96**	(0.91)	0.17*	(0.09)
Female X intended	-1.04	(1.72)	-0.14	(0.17)
Female X unintended	-6.21*	(2.58)	-0.39	(0.23)
Age	0.10	(0.08)	-0.01	(0.01)
Non-White	2.62*	(1.07)	-0.10	(0.10)
Less than high school	3.41†	(1.89)	0.16	(0.17)
High school	1.66†	(0.92)	0.00	(0.09)
Some college	0.25	(0.95)	0.05	(0.09)
Income	-0.00	(0.01)	-0.00†	(0.00)
Unemployed	1.38	(1.22)	-0.05	(0.11)
Part-time work	-1.93†	(1.05)	0.10	(0.11)
Single	3.61***	(0.91)	-0.59***	(0.09)
Separated/divorced/widowed	7.20***	(2.10)	-0.82***	(0.18)
Cohabiting	3.59**	(1.37)	-0.13	(0.13)
Lagged dependent variable	0.23***	(0.03)	0.18***	(0.04)
Constant	7.17***	(0.99)	5.65***	(0.10)
Adjusted R^2	0.14		0.11	

Note: Age, income, and lagged dependent variable were centered at their means.
**** p<0.001, ** p<0.01, * p<0.05, † p<0.10*

Figure 2.2. *Conditional Mean Depressive Symptoms and Happiness*



Note: Asterisks indicate significant difference between females and males
**** p < .001, ** p < .01, * p < .05, † p < .10*

[c] *Significant difference from childless, p < .05*

Table 2.3. *Results from Financial Strain and Self-Efficacy Mediation Analysis (N = 1,714)*

	Depressive symptoms				Happiness	
	Model 1		Model 2		Model 3	
Variable	*B*	*(SE B)*	*B*	*(SE B)*	*B*	*(SE B)*
Intended birth	1.61	(1.21)	0.49	(1.25)	0.09	(0.11)
Unintended birth	3.60†	(1.88)	3.51†	(1.88)	0.05	(0.15)
Female	2.75**	(0.89)	2.37**	(0.88)	0.23**	(0.08)
Female X intended	-1.33	(1.63)	-0.49	(1.62)	-0.20	(0.16)
Female X unintended	-5.74*	(2.49)	-6.58**	(2.49)	-0.36	(0.22)
Age	0.05	(0.08)	0.06	(0.08)	-0.01	(0.01)
Non-White	2.94**	(1.04)	2.19*	(1.04)	-0.06	(0.09)
Less than high school	2.46	(1.83)	1.76	(1.86)	0.32†	(0.17)
High school	1.03	(0.91)	0.81	(0.89)	0.09	(0.09)
Some college	0.01	(0.95)	-0.23	(0.93)	0.10	(0.09)
Income	-0.00	(0.01)	0.00	(0.01)	-0.00*	(0.00)
Unemployed	1.55	(1.17)	1.06	(1.19)	-0.02	(0.10)
Part-time work	-1.62	(1.06)	-1.91†	(1.02)	0.11	(0.11)
Single	2.42**	(0.89)	3.57***	(0.89)	-0.59***	(0.09)
Separated/divorced/widowed	6.18***	(1.81)	6.92**	(2.14)	-0.79***	(0.18)
Cohabiting	2.87*	(1.27)	3.33**	(1.29)	-0.12	(0.12)
Lagged dependent variable	0.21***	(0.03)	0.19***	(0.03)	0.15***	(0.03)
Self-efficacy (Wave 1)	-0.39	(0.43)				
Self-efficacy (Wave 2)	-3.42***	(0.50)				
Financial strain			3.13***	(0.32)	-0.29***	(0.03)
Constant	22.21***	(2.45)	-0.72	(1.33)	6.37***	(0.13)
Adjusted R^2	0.20		0.20		0.17	

Note: Age, income, and lagged dependent variable were centered at their means.

**** p < .001, ** p < .01, * p < .05, † p < .10*

Appendix Table 2.1. *Summary of Coefficients From Models Predicting Depressive Symptoms and Happiness (N = 1,714)*

	Regressor Variable		Change Score		Fixed Effects	
	B	*(SE B)*	*B*	*(SE B)*	*B*	*(SE B)*
Depressive Symptoms						
Female intended	0.84	(1.38)	1.23	(1.70)	-0.73	(1.62)
Female unintended	-1.49	(1.76)	-2.71	(2.95)	-3.68	(2.86)
Male intended	1.87	(1.30)	2.02	(2.25)	1.21	(2.07)
Male unintended	4.72*	(1.95)	3.44	(2.61)	3.91	(2.63)
Happiness						
Female intended	-0.19	(0.14)	-0.42*	(0.18)	-0.37*	(0.16)
Female unintended	-0.46*	(0.18)	-0.42†	(0.25)	-0.45†	(0.24)
Male intended	-0.05	(0.12)	-0.32†	(0.17)	-0.20	(0.16)
Male unintended	-0.07	(0.16)	-0.14	(0.25)	-0.10	(0.24)

Note: Comparison group is those who remained childless at Wave 2
All models control for parent's age, race, education, employment, income, and union status.
**** p < .001, ** p < .01, * p < .05, † p < .10*

CHAPTER 3: UNINTENDED BIRTH AND CHILD WELL-BEING OVER THE LIFE COURSE

A large body of research on family formation and child well-being focuses on the role of family structure, such as whether the children's parents are married, cohabiting, divorced, or remarried. Empirical research on family structure and child well-being generally finds that children living with married biological parents fare better than children in other family structures (Amato 2005; Artis 2007; Brown 2004; Brown 2010; McLanahan and Sandefur 1994; McLanahan and Percheski 2008; Thomson, Hanson, and McLanahan 1994). This literature does not consider whether the children were intended or unintended at the time of conception, however. Unintended births include those that were mistimed (i.e., the mother reported that she wanted a child at some point in the future, but the pregnancy occurred too soon) or unwanted (i.e., the mother reported that she did not want a child). Pregnancy intentions may be an important factor in understanding the link between family formation and child well-being, and the current study builds on existing research to examine whether children resulting from unintended pregnancies fare worse than children resulting from intended pregnancies, net of their parents' marital status.

Demographic, social, and cultural trends in childbearing make pregnancy intentions a salient consideration for research on child well-being. First, the United States has a surprisingly high rate of unintended fertility despite increases in the availability and efficacy of contraceptives. Estimates from the 2006-2010 National Survey of Family Growth suggest that over one-third of births (37%) were unintended at the time of conception (Mosher, Jones, and Abma 2012). It is important to understand the implications of this demographic trend in fertility for child well-being.

Second, marriage and childbearing are becoming increasingly decoupled as more parents are choosing to have children outside of marriage (Smock and Greenland 2010). As norms about childbearing have shifted, marriage has become increasingly deinstitutionalized and cohabitation has become a more acceptable alternative to marriage (Cherlin 2004). Recent estimates suggest that almost half of births to cohabiting couples and a third of births to unmarried, non-cohabiting couples were intended at the time of conception (Mosher, Jones, and Abma 2012). As a result, family structure may not fully capture the contemporary context of childbearing. Although prior research sometimes infers that all nonmarital births are unintended, this assumption is problematic in light of recent trends (Musick 2002). This study acknowledges the unique role of pregnancy intentions as part of the changing context of childbearing, and disentangles the independent effects of pregnancy intentions and marital status on child well-being.

Finally, patterns of unintended fertility may exacerbate inequality. Unintended births are more common among relatively disadvantaged groups, such as women who are unmarried, have low levels of education and income, and are racial minorities (Mosher, Jones, and Abma 2012; Musick et al. 2009). Trends in unintended fertility have also diverged by socioeconomic status over time (Finer and Henshaw 2006). From 1994 to 2006, women with income below the poverty line experienced a sharp increase in unintended pregnancy, while women with income 200% or greater than the poverty line experienced a monotonic decrease (Finer and Zolna 2011; Guttmacher Institute 2012). This socioeconomic and racial stratification is concerning because some research suggests that unintended births exert significant burdens on families and have serious consequences for parents and children, such as poor prenatal care, low birth weight, maternal depression, and child abuse (Brown and Eisenberg 1995). If unintended childbearing has deleterious effects on child development, this pattern of fertility may serve as a vehicle for

increasing inequality between children of different social classes (McLanahan 2004).

Although there are concerns about the negative effects of unintended birth on parents and young children, relatively little research has rigorously examined the development and well-being of children resulting from unintended pregnancies[1]. A small body of research in the U.S. has examined developmental outcomes for unintended children during childhood (Baydar 1995; Crissey 2005), adolescence (Barber and East 2009; Barber and East 2011; Joyce, Kaestner, and Korenman 2000), and adulthood (Axinn, Barber, and Thornton 1998; Barber, Axinn, and Thornton 1999), but these studies yielded mixed or inconclusive evidence about the relationship between pregnancy intentions and child well-being. The current study builds on this research by examining pregnancy intentions and several metrics of development and well-being for children at different points in the life course. This study leverages a nationally representative cohort sample, longitudinal data, and propensity score techniques to address methodological limitations of prior research, such as unrepresentative samples, cross-sectional analyses that do not support causal inference, and sibling fixed effects models that make inappropriate assumptions about the family processes associated with unintended births and are therefore susceptible to attenuation bias.

This study will examine whether pregnancy intentions are associated with three different measures of child development and well-being at different stages of the life course: (1) the home environment of infants, young children, and adolescents age 0-14; (2) children's behavioral problems and cognitive test scores among children and adolescents age 4-14; (3) depressive symptoms among adolescents, young adults, and adults age 14-30. This study also examines whether the relationship between pregnancy intentions and child well-being varies by the child's

age. Examining child well-being at different stages of the life course will shed light on whether unintended birth has short-term consequences for young children, and/or longer-term cumulative consequences as these children transition into adulthood.

THEORETICAL FRAMEWORKS

Why might we expect pregnancy intentions to be related to various aspects of child well-being? Three theoretical frameworks provide insight about the mechanisms that potentially link unintended birth to poor child well-being. Namely, economic resources, parenting resources, and family stress and instability might account for poorer well-being among children who were considered unintended at the time of conception. Alternatively, associations between pregnancy intentions and child well-being may be spurious due to selection bias.

Economic resources

Parents with unintended births may experience limitations in the financial resources they can invest in children, especially if they are not financially prepared to have a child. Economic theory posits that additional children raise the cost of "child quality" as more financial resources are required to achieve a similar level of quality across multiple children (Becker and Lewis 1973). Having children by definition increases family size and therefore constrains the amount of money that can be spent on each child. This may be particularly salient in the case of unintended births, which can impose unexpected financial burdens on a family, or interrupt a career or educational trajectory that would have ensured longer term economic resources (Abma and Mott 1994). Prior research provides some indication that unintended births are associated with financial strain, which explains some of the relationship between unintended birth and poor psychological well-being among first-time mothers and fathers (Su 2012). Constrained

[1] In this paper I sometimes refer to children resulting from unintended pregnancies as "unintended children" for economy of expression, although the intention technically refers to the pregnancy at the time of conception and not

economic resources may have negative effects on all children in a family with an unintended birth, and may limit investments in goods and services that are associated with child well-being, such as quality child care and education.

Parenting resources

Sociological theory posits that parenting resources and parenting quality play a key role in child well-being (Carlson and Corcoran 2001; McLanahan and Sandefur 1994; McLanahan 2004; McLanahan and Percheski 2008). Although this theoretical perspective is often applied to research on family structure, it is plausible that similar mechanisms operate for pregnancy intentions. Unintended birth might limit a mother's ability to provide high quality parenting because it is likely to be associated with poor maternal psychological well-being, relationship instability, limited social support, economic burdens, and child care difficulties. Indeed, there is evidence that parents with unintended birth experience poorer psychological well-being compared to childless adults (Su 2012) and compared to parents with intended births (Barber, Axinn, and Thornton 1999; Bronte-Tinkew et al. 2009). Diminished psychological well-being is, in turn, associated with less support and communication among mothers and fathers (Bronte-Tinkew et al. 2009). Mothers with unintended children also may spend less leisure time with their children, provide less emotional support, and may engage in harsher or more physically punitive parenting behaviors, such as spanking (Barber, Axinn, and Thornton 1999; Barber and East 2009). There is also some evidence unintended birth is linked to poorer mother-child relationships from late adolescence through early adulthood (specifically at ages 18, 23, and 31) (Barber, Axinn, and Thornton 1999). In sum, unintended births are linked to parents' poorer psychological well-being and less effective parenting behaviors, and in turn may be linked to poor child well-being. These differential investments may also have longer term impacts on the

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necessarily the resulting child.

well-being of unintended children.

Family stress and instability

The family stress and instability perspective focuses on the negative effects associated with family structure transitions, such as divorce, remarriage, and the formation or dissolution of cohabiting relationships. This theory posits that changes in family structure have as much or more impact on child well-being compared to the type of family structure they experience (Cherlin 2009; Fomby and Cherlin 2007). Prior research supports this theory, providing evidence that family structure instability is harmful for children (Cavanagh and Huston 2006; Fomby and Cherlin 2007; Wu 1996). In fact, families with unintended births are more likely to experience family instability compared to parents with intended births. Research on the stability of coresidential unions finds that both married and cohabiting couples are at a greater risk of breaking up or divorcing after an unintended birth, even when accounting for unobserved characteristics in fixed effects models (Guzzo and Hayford 2012). As a result, an unintended birth might introduce instability into the family system, reorganize spousal and familial roles, and expose children to the deleterious effects of relationship transitions.

Selection

Alternatively, associations between unintended birth and child well-being may be spurious due to characteristics that make a parent both more likely to experience an unintended birth and to have children with poor well-being. In other words, unintended birth and child well-being might co-vary without being causally linked. For example, adults who feel like they have very little control over their lives may be more likely to have an unintended birth, and may also use less effective parenting techniques that are associated with poorer child development.

Unintended births are not randomly or evenly distributed across the population; they are

more common among women who are unmarried, have low levels of education, low income, and are non-Hispanic black (Mosher, Jones, and Abma 2012). Because these groups are relatively disadvantaged, their children might experience poorer well-being as a function of their socioeconomic status or race rather than their pregnancy intentions. It is also possible that associations between unintended birth and child well-being are confounded by the effects of family structure. Unintended births are more common among unmarried or cohabiting couples, and these family structures are linked with poorer child development.

Selection bias presents a significant challenge in research on unintended births and child well-being, and much prior research on this topic does not adequately adjust for potentially confounding selection factors. Indeed, prior research suggests that the link between unintended births and child development is at least partially explained by maternal characteristics and family background (Barber and East 2009; Baydar 1995; Joyce, Kaestner, and Korenman 2000). Therefore, it is important that studies examining the link between pregnancy intentions and child well-being acknowledge and carefully address concerns about selection.

Effects of pregnancy intentions over the life course

The mechanisms outlined above may result in poorer well-being among young children, and their effects may also extend to later stages of the life course. For example, attachment theory posits that early parent-child interactions and family processes are linked to child development and eventually adult behavior. Positive interactions with parents help children develop a sense of security and positive images of themselves and others, while negative interactions may lead to insecurity and doubts about their own self-worth or self-efficacy (Belsky and Cassidy 1995; Mikulincer and Shaver 2012). These orientations develop into patterns of attachment that extend to adulthood and are related to the child's own parenting behavior, which

contributes to the intergenerational transmission of attachment behaviors (Mikulincer and Shaver 2012). If unintended birth is associated with diminished parenting resources and family stability, children may have insecure attachment patterns that hamper their development and these effects may persist into adulthood. This study examines this possibility by including multiple measures of behavioral and cognitive development that are collected at different life stages (infants, children, adolescents, and adults), and testing whether the effect of unintended birth varies by the child's age.

PRIOR RESEARCH ON WELL-BEING AMONG CHILDREN WHO WERE UNINTENDED AT CONCEPTION

Prior research provides mixed evidence on the relationship between pregnancy intentions and child well-being at various stages of the life course. I review this literature below to document existing knowledge and highlight the current study's contribution. The literature is organized by the children's age group: infants and preschoolers age 3 and under, children and adolescents age 4-15, and adults age 18-31. To give a brief overview, there is evidence that unintended children receive poorer quality parenting as infants and preschoolers, and have poorer relationships with their mothers as adolescents and adults compared to intended children. There is no evidence that unintended children have poorer behavioral and cognitive outcomes in adolescence compared to intended children. There is some evidence that unintended children have lower self-esteem than intended children in adulthood, although these findings may not be generalizable to a national population.

Infants and preschoolers

Research on preschoolers generally finds that mothers of unintended children have lower-quality parenting practices than mothers of intended children, but provides mixed evidence on

the developmental implications for children. Baydar (1995) estimated cross-sectional multivariate regressions using data from the 1986 and 1988 waves of the NLSY79, and found that preschoolers who were considered mistimed at the time of conception were more likely to have mothers with an aggressive and controlling parenting style compared to intended preschoolers, but had similar opportunities for skill development and mother-child relationship quality. Crissey (2005) estimated multivariate regressions with a nationally representative sample of U.S. births in 1988 from the National Maternal and Infant Health Survey and the 1991 follow-up to examine associations between various measurements of pregnancy intentions and child well-being and development at age 3. Crissey found evidence that unintended children were more likely to have poor health (based on the mother's reports), undesirable activity levels, and below median scores on developmental assessments compared to intended children.

Although both of these studies used longitudinal data, their analyses were primarily descriptive. Baydar (1995) used two waves of data and estimated cross-sectional regressions for each wave of data separately, which describe associations between unintended birth and child well-being but do not support causal inference. Crissey (2005) used two waves of data and included measures of maternal marital status and poverty status that reflected stability over time (e.g., indicators poverty at both waves, poverty at one wave, poverty at neither wave), but was unable to account for maternal characteristics prior to the birth. The current study extends this prior research by examining the home environment for children age 0-14, leveraging multiple waves of longitudinal data, and employing propensity score techniques that more stringently assess causality by carefully adjusting the models for background characteristics that might be associated with selection into unintended birth.

Children and adolescents

Research linking pregnancy intentions with well-being among older children and adolescents is mixed. Some research finds evidence that unintended births are linked to poorer parenting and child well-being (Barber, Axinn, and Thornton 1999; Barber and East 2009; Barber and East 2011), while other research casts doubt on the causal relationship between pregnancy intentions and well-being (Joyce, Kaestner, and Korenman 2000). These studies reach disparate conclusions in part because they estimate statistical models with different assumptions and identification strategies. I provide more detail on these studies below.

Barber, Axinn, and Thornton (1999) examined cross-sectional data from the 1987-88 wave of the National Survey of Families and Households, and found that mothers with unwanted births spanked their children more and spent less leisure time with them compared to mothers with intended births. Barber and East (2009) leveraged longitudinal data from the NLSY79 to examine the parenting resources available to siblings based on their birth intention. Using sibling fixed effects models, their findings suggested that unintended children received less cognitively stimulating and emotionally supportive parenting than their intended siblings. These studies provide relatively consistent evidence that unintended children receive poorer quality parenting than intended children.

Joyce, Kaestner, and Korenman (2000) also used data from the NLSY79 to examine the relationship between pregnancy intentions and child health and development for children ages 3-13. The authors pursued several estimation strategies to address concerns about selection and unobserved fixed characteristics that might confound the estimates, including cross-sectional regressions, sibling fixed effects models, and between-family regression models. These models yielded mixed results. Cross-sectional and between-family models that adjusted for exogenous characteristics suggested that unwanted and mistimed children had lower cognitive test scores

and more behavior problems than intended children, but this association disappeared once they adjusted for potentially endogenous characteristics such as the child's birth order, mother's age at birth, and mother's cognitive test scores. Sibling fixed effects models, which address concerns about bias due to unobserved family characteristics and genetic endowments by comparing intended and unintended siblings from the same family, suggested that there was no association between pregnancy intentions and children's cognitive test scores or behavior problems. The authors concluded that pregnancy intentions had little or no causal relationship with children's behavioral and cognitive development once family and environmental factors were taken into account. They also acknowledged, however, that their results would be biased downward if the consequences of unintended births extended to the entire family and were not limited to the unintended child.

Joyce, Kaestner, and Korenman (2000) made an important advance in pregnancy intention research by leveraging a national sample and estimating sibling fixed-effects models to adjust for unobservable factors that might be associated with both unwanted birth and child well-being. Much prior research failed to adequately adjust for background characteristics that might confound estimates (Gipson, Koenig, and Hindin 2008). Nonetheless, their approach has some limitations in light of recent research. Due to the nature of sibling fixed-effects models, the sample is restricted to families in which there are multiple children with different intention statuses (i.e., one child is intended and one child is unintended). This is potentially problematic because women with early unintended births are more likely to have subsequent unintended births (Guzzo and Hayford 2011). As such, families with both intended and unintended births might represent a unique subset of the population and limit the generalizability of the study's findings.

Moreover, there is evidence that unintended births have negative "spillover" effects, which Joyce and colleagues acknowledged might threaten the assumptions of their sibling fixed effects analyses and create attenuation bias. Barber and East (2009; 2011) examined changes in the home environment and children's behavioral problems after the birth of an unintended sibling to test the spillover hypothesis, which posits that unintended childbearing has consequences for the whole family and is not limited to the unintended child. The authors estimated lagged dependent variable models, which address concerns about selection on the dependent variable and provide a test of the spillover hypothesis. Their results indicated that unintended births were linked with decreased parental resources for intended siblings in the household, in support of the spillover hypotheses (Barber and East 2009). They also found that intended boys with unintended younger siblings had larger increases in behavior problems than intended boys who had intended younger siblings (Barber and East 2011). The spillover hypothesis implies that results from sibling fixed effects models may underestimate the relationship between unintended birth and child well-being, because all children in families with unintended births experience negative consequences.

In sum, research on pregnancy intentions and child well-being among younger children and adolescents is mixed due to the assumptions of different modeling techniques, but generally suggests a null or negative relationship between unintended birth and well-being. The current study will contribute to this debate by addressing some of the methodological limitations of prior research. The study will examine a sample of children from various family types, including those with only children and those with siblings of the same intention status. The analytic approach will facilitate a careful comparison of well-being between intended and unintended children in different families, which avoids the attenuation bias of sibling fixed effects models.

Adults

Extant research suggests that unintended birth has long-term consequences for children as they enter adulthood (Axinn, Barber, and Thornton 1998; Barber, Axinn, and Thornton 1999). Drawing on data from the Intergenerational Panel Study of Mothers and Children, a longitudinal study with a sample of married white mothers who gave birth in the Detroit metropolitan area in 1961, Barber, Axinn, and Thornton (1999) found that mothers with unwanted births had lower quality relationships with their children from age 18 to adulthood (ages 23 and 31), compared to mothers with intended births. Using the same data set, Axinn, Barber, and Thornton (1998) also found that children who were considered mistimed or unwanted at the time of conception reported lower self esteem at age 23 compared to children who were intended. To my knowledge, these are the only U.S. studies that have examined the longer-term well-being of unintended children. These studies provide some evidence that unintended birth has far-reaching consequences for children, although the effect sizes were small and the unique sample limits the generalizability of the findings. Furthermore, the study does not have measures of maternal characteristics prior to the birth, which limits the ability to model selection into unintended childbearing and assess causality. The current study will extend this research by drawing on a nationally representative, longitudinal cohort sample, modeling selection into unintended childbearing to address some concerns about selection bias, and examining a distinct dimension of adult well-being: depressive symptoms among adolescents and adults age 14-30.

METHOD

Data and sample

This study draws on longitudinal data from the National Longitudinal Survey of Youth, 1979 (NLSY79), which has been used in other studies of unintended birth and child well-being

(Barber and East 2009; Barber and East 2011; Baydar 1995; Joyce, Kaestner, and Korenman 2000). The NLSY79 is a nationally representative, longitudinal birth cohort study following individuals who were born between 1957 and 1964. Respondents were interviewed annually from 1979 through 1994, and biennially since.

In 1986, the NLSY began biennial interviews and assessments of children born to female respondents of the NLSY79, which comprises the child/young adult sample. The child/young adult sample is representative of American children born to the women of the NLSY79. Children of NLSY79 mothers were given assessments to measure their cognitive and social development. Beginning in 1994, the child assessments were only administered to children who were younger than 15; children who were age 15 by the end of the survey year were given a young adult questionnaire similar to the one their mothers completed during late adolescence. This dataset allows researchers to link the mother's report of pregnancy intentions with several cognitive and behavioral outcomes of their children in childhood, adolescence and early adulthood. It also provides rich information about the mother's family background, fertility and relationship history, and other demographic characteristics that might be related to selection into having an unintended birth.

The sample in this study is limited to children born in 1979 or later (about 90% of the child sample), because family characteristics were first collected in 1979. The sample also excludes mothers in the military and disadvantaged white youth subsamples, which were dropped by the NLSY in 1985 and 1991, respectively. I linked eligible mothers with their children, randomly selecting one focal child per mother to ensure that observations are independent across children (for a similar approach see Baydar 1995). The data were then reshaped into person-year observations such that each child can contribute an observation for

each wave in which they were interviewed. The sample excludes person-year observations that were missing all dependent variables (8% of eligible person-year observations), pregnancy intention data (14% of eligible person-year observations), or one or more control variables (14% of eligible person-year observations). The final sample is comprised of 2,549 unique mother-child pairs, who contribute 22,247 person-year observations.

The sample that was dropped due to missing control variables was slightly more disadvantaged than the retained sample, which may have implications for the study's findings. For example, mothers in the dropped sample were less likely to be white, more likely to have had a foreign language spoken in the household at age 14, less likely to have lived with both biological parents at age 14, had lower cognitive test scores, and were more likely to be below the federal poverty line (see Appendix Table 3.1). Mothers in the dropped sample were also slightly more likely to report that their child was unwanted. If dropping this subset of the sample introduces some bias, it will likely result in conservative estimates of the relationship between unintended births and child well-being because the most disadvantaged respondents were not included in the analysis[2].

Measures

Key independent variable.

The NLSY79 began measuring pregnancy intentions in 1982. In 1982 respondents reported pregnancy intentions retrospectively for all pregnancies, and in subsequent waves they reported retrospectively for pregnancies that occurred since the last wave and concurrently for any current pregnancies. Female respondents were first asked whether they were using contraception before becoming pregnant. If they were not, they were asked whether they stopped using contraception because they wanted to become pregnant. Respondents who were

using contraception or did not want to become pregnant despite stopping contraception were then asked, "Just before you became pregnant the (first, second, third, etc) time, did you want to become pregnant when you did?" If a respondent answered no, she was asked, "Did you want a(nother) baby but not at that time, or did you want (none/no more) at all?" Pregnancies are classified as intended if the respondent stopped using contraception because she wanted to get pregnant, reported that she wanted to become pregnant when she did, or reported that it "didn't matter" whether she got pregnant[3]. Pregnancies are classified as mistimed if the respondent wanted another baby but not at that time, and unwanted if she did not want a baby at all. For the main analyses, I collapse the mistimed and unwanted births into a single group of unintended births. Although these births may be qualitatively different, the dichotomous categorization is better suited to the methodological approach, which incorporates propensity scores (the estimated conditional probability of selection into unintended birth). Because prior studies have shown that these distinctions can be salient for understanding pregnancy intentions and child well-being (Joyce, Kaestner, and Korenman 2000) , I present supplemental analyses that examine differences between mistimed and unwanted births in the appendix.

The coding of pregnancy intentions in the NLSY79 is somewhat complicated because one must rely on the child's year of birth to map the mother's pregnancy intention to each specific child. Women were asked to report the pregnancy intentions of children born since the last interview, and not all women were interviewed at every wave. Furthermore, from 1982-1990, the mother reported pregnancy intentions for all pregnancies regardless of the pregnancy outcome. Beginning in 1992, women reported pregnancy intentions only for pregnancies that resulted in live births. The difficulty of coding this variable is acknowledged in other published

[2] I will impute missing data using multiple imputation in a future iteration of this analysis.

studies that rely on these data (Barber and East 2009; Barber and East 2011; Baydar 1995). To examine the reliability of the algorithm I developed to code this variable, I compared my estimates of pregnancy intentions to those in six other published studies that use a similar variable (see Appendix Table 3.2). I roughly approximated the samples used in each study to facilitate the comparison (e.g., if the other study's sample was children born in 1978-1992 who were not missing data on the dependent variable, I restricted my sample to 1978-1992 but did not exclude children with missing data). My estimates of unintended births are within one or two percentage points of the other studies, which suggests that the coding algorithm reliably categorized pregnancy intentions.

Although pregnancy intention measures are commonly used in research, their validity is often debated. One concern is that these measures may suffer from retrospective reporting bias or ex post rationalization (Rosenzweig and Wolpin 1993; Sable 1999). Parents who carry an unintended pregnancy to term may be less likely to later report that their child was not planned regardless of how they felt when the child was conceived. Further, the intention variables might over-simplify the concept of pregnancy planning by measuring it as a binary state; unintended pregnancies are often characterized by ambivalence rather than being unequivocally planned or unintended (Edin et al. 2007). Despite these concerns, these measures are related to child outcomes in predictable ways (Brown and Eisenberg 1995). Further, there is evidence that retrospective accounts of pregnancy intentions in the NLSY do not bias statistical estimates of the effects of unintended fertility (Joyce, Kaestner, and Korenman 2002).

Dependent variables.

This study taps into several dimensions of child well-being: (a) the quality of the home

[3] Only 5% of pregnancies were classified as intended because the mother reported it "didn't matter" when the pregnancy occurred.

environment for infants, children, and adolescents age 0-14; (b) behavioral problems and anxious/depressed behavior among children and adolescents age 4-14; (c) cognitive test scores among children and adolescents age 5-14; and (d) depressive symptoms among adolescents and adults age 14-30.

I assess the home environment for children age 0-14 using the emotional support and cognitive stimulation sub-scales of the Home Observation Measurement of the Environment-Short Form (HOME-SF) (Bradley and Caldwell 1984a; 1984b). The HOME scales have a high degree of predictive validity as demonstrated by their widespread use in a range of social science research (Mott 2004). Children contributed five data points for the HOME scale on average. The scales vary by age, and are a combination of interviewer observations and the mother's report of the home environment. The emotional support battery asks questions such as "About how many times, if any, have you had to spank child in the past week?"; "How often does child eat a meal with both you and his/her father/step/father-figure?"; as well as how the mother responds to tantrums or hitting. The interviewer observed items such as whether the mother caressed, kissed, or hugged the child, conversed with the child, or conveyed a positive feeling about the child. The cognitive stimulation battery asks questions such as "How often do you get a chance to read to child?"; "When your family watches TV, do you or (father) discuss programs with him/her?"; and "How many books does child have?" The interviewer observations include items such as whether the child's play environment is safe and whether the home is reasonably clean. The raw score for the HOME-SF is the sum of individual item scores; the raw score varies by age group because the number of individual items varies according to the age of the child. There are no appropriate national norms available for these measures, but they were internally standardized to the full NLSY sample by age with a mean of 100 and standard deviation of 15 to

allow comparison across children of different ages.

This study assesses children's behavioral problems among children age 4-14 with the total Behavior Problem Index (BPI) and the anxious/depressed subscale of the BPI. Children contributed an average of four observations for the BPI. The BPI is a summary measure of behavior problems that is adapted from Achenbach and Edlebrock behavioral checklist (1981), and is based on 28 mother-reported questions regarding the child's behavior and attitudes in the previous three months. Mothers rate each item using a 3-point scale (often, sometimes, or not true); these ratings are dichotomized such that responses of "sometimes" or "often" are coded as "1" and "not true" is coded as "0." Items are summed such that higher scores indicate more behavior problems. The score is then normed by age and sex to have a national mean of 100 and a standard deviation of 15. The anxious/depressed subscale of the BPI is comprised of five items from the total scale, such as "is unhappy, sad, or depressed," and "feels worthless or inferior." I examine the anxious/depressed subscale specifically because there is also a measure of depressive symptoms for young adults age 14-30, and the two measures provide some continuity in assessing depression at different stages of development.

Child's cognitive development for children age 5-14 is assessed with the Peabody Individual Achievement Tests (PIAT) in math and reading comprehension. Children contributed three to four observations for these measures, on average. PIAT scores were normed by age in the late 1960s to a national mean of 100 with a standard deviation of 15. The PIAT is a widely used assessment of academic achievement that has high validity and reliability (Bureau of Labor Statistics).

Depressive symptoms are measured with a 7-item scale derived from the Center for Epidemiological Studies Depression scale (CES-D) (Radloff 1977), which was administered in

1994-2010 among adolescents and young adults age 14-30. Children contributed an average of four observations for the CES-D. Respondents were asked how often in the previous week they: (a) did not feel like eating; (b) had trouble keeping their mind on what they were doing; (c) felt depressed; (d) felt that everything they did was an effort; (e) had restless sleep; (f) felt sad; (g) could not get "going." Respondents rated the frequency of each item on a four-point scale: (a) "rarely or none of the time (<1 day)" (coded 0); (b) "some or a little of the time (1-2 days)" (coded 1); (c) "occasionally or a moderate amount of the time (3-4 days)" (coded 2); or (d) "most or all of the time (5-7 days)" (coded 3). The items were summed to create an overall score, with higher scores indicating more depressive symptoms.

Additional covariates.

The analyses adjust for characteristics potentially related to both the selection into unintended childbearing and child well-being. Several variables capture the mother's family background and characteristics before her first birth. Race/ethnicity is measured with a categorical variable that indicates whether she is white, black, Hispanic, or another race. The mother's family background at age 14 is captured with variables that indicate region of residence (South/non-South and urban/rural); whether a foreign language was spoken in the home; family structure (lived with biological mother and father, or some other arrangement); and whether there were literacy materials in the household. A categorical variable for religion at birth indicates whether the mother was raised Catholic, liberal Protestant, conservative Protestant, or none/other. A continuous variable indicates the highest grade her mother (the child's grandmother) completed in school by 1979. The mother's age at first birth is measured in years. Mother's cognitive ability was measured in 1980 with the Armed Forces Qualification Test (AFQT). AFQT scores were normed by age and reported as a percentile. The Rotter Locus of

Control Scale measures the extent to which individuals believe they have control over their lives (Rotter 1966). The scale indicates whether individuals have a high sense of internal control (i.e., feeling in control of their own lives through self-motivation or self-discipline) or external control (i.e., feeling little personal control and believing that fate or luck controls their lives), which addresses the concern that the inability to effectively manage one's life is linked to both unintended birth and poor child well-being. The scale was administered in 1979; scores range from 4 – 16 and were reverse-coded such that higher scores indicate more internal control. Finally, dummy variables indicate whether the focal child was first-born, and whether the child was a nonmarital birth. Nonmarital births are determined from the child's birth date and the start/end dates of the mother's marriages. This set of controls is used to model selection into unintended childbearing in the propensity score model.

Several child characteristics are included in the conditional regressions to further isolate the association between pregnancy intentions and child well-being. A dichotomous variable indicates whether the child is male (1= male, 0=female). I include dummy variables for the child's year of birth and a continuous variable for the child's age in years because the cohort sample creates a correlation between birth year, child's age, and survey wave. The NLSY survey measured child's age in months from ages 0-14 (i.e., the child sample), and in whole years from ages 15 and older (i.e., the young adult sample). As a result, age is measured with more precision for younger children.

Analytic strategy

This study employs traditional OLS regression and weighted OLS regression using weights derived from propensity scores to assess the relationship between pregnancy intentions at the time of conception (i.e., whether the child was the result of an unintended or intended

pregnancy), and well-being for young children, adolescents, and young adults. The traditional OLS regressions are represented in equation (1), where Y_{it} is the child well-being outcome of child *i* at time *t*, D_{i0} is a dummy variable indicating whether the child was unintended at conception (intended is the referent), the vector X_{i0} represents a series of control variables that capture the mother's characteristics and family background before her first birth, the vector Z_{i0} represents a series of child characteristics measured at birth (described above). I adjust the standard errors to account for the fact that observations are not independent (i.e., respondents can contribute more than one observation).

$$Y_{it} = \alpha + \beta_1 D_{i0} + \beta_{2\text{-}18} X_{i0} + \beta_{19\text{-}46} Z_{i0} + e_{it} \qquad (1)$$

The next phase of analysis employs weighted OLS regression using propensity scores to derive the weights, which addresses some of the limitations of traditional regression (Dehejia and Wahba 1999; Morgan and Winship 2007; Rosenbaum and Rubin 1983; Rosenbaum and Rubin 1984). Specifically, the propensity score is nonparametric and does not require assumptions about a linear relationship between the dependent and independent variables. It also allows me to restrict inference to the range of common support (i.e., the area of the propensity score distribution for which there are both treatment and control cases), and discard treatment cases that do not have an appropriate comparison. Finally, the weighted regressions estimate the average treatment effect on the treated (ATT), which is a well-defined parameter that indicates the average effect of an unintended birth among those who are most likely to have unintended births. In contrast, the unweighted OLS regression estimates an uncontrolled average effect of unintended birth across everyone in the population, including those who are unlikely to have an unintended birth.

The first step of the weighted regression analysis is the estimation of propensity scores,

which are conditional probabilities of selection into unintended birth (Rosenbaum and Rubin 1983). In equation (2), *D* is the treatment variable (a value of 1 indicates that the child was unintended at the time of conception, and 0 indicates the child was intended). *X* is a vector of covariates that capture the mother's background and family characteristics and are associated with selection into having an unintended birth. The propensity score model also includes 28 interaction terms to achieve the best possible balance between the treatment and control groups. Results from the full propensity score model are available in Appendix Table 3.3.

$$\text{Logit}(D) = \alpha + \beta_{1\text{-}45}X + e \qquad (2)$$

Next, I follow Morgan and Todd's (2008) procedure for calculating weights using the estimated propensity scores, $\hat{p}_i$, from equation (2). The estimated propensity scores are used to form ATT weights, $w_{i,\text{ATT}}$, as shown in equation (3) (Morgan and Todd 2008, p. 244). I then multiplied the ATT weights by the survey sampling weights to account for the complex sampling design.

$$\begin{aligned} &\text{For } d_i{=}1\text{: } w_{i,\text{ATT}} = 1 \\ &\text{For } d_i{=}0\text{: } w_{i,\text{ATT}} = \frac{\hat{p}_i}{1-\hat{p}_i} \end{aligned} \qquad (3)$$

These ATT weights are conceptually similar to survey sampling weights insofar as they weight the samples to be representative of a target population. The ATT weights use the treatment group (mothers with unintended births) as the target population, and weight the control group (mothers with intended births) such that it is a representative sample of the population-level treatment group. In other words, mothers who had an intended birth but had a high likelihood of having an unintended birth, as predicted by the propensity score, will receive more weight.

The goal is for these weights to effectively align the treatment and control groups,

approximating an experimental design in which treatment (unintended births) is randomly assigned and unrelated to other characteristics. The underlying assumption is that there are no additional confounding differences between mothers who have unintended births and mothers who have intended births after applying the ATT weights. If no statistically significant differences between the groups remain, the data are considered to be "balanced." I assess the balance between the treatment and control groups by estimating the average standardized mean differences between treatment and control groups across all covariates in the model, and the standardized differences in standard deviations for continuous variables (Morgan and Todd 2008; Rubin 1973). Standardized differences range from 0-1, and a value of 0 indicates that the data are perfectly balanced. The ATT weights perform quite well in balancing the data; the mean standardized difference between the intended and unintended groups was reduced from 0.24 using the sampling weights to 0.01 using the ATT weights, and there are no statistically significant differences in mean characteristics once the weights are applied. Tables demonstrating the balance achieved by the ATT weights are available in Appendix Table 3.4 and Appendix Table 3.5.

I restrict all models to the region of common support, which is the range of the propensity score for which there are respondents in both the treatment and control groups. There is significant overlap between the treatment and control groups; only 1% of person-year observations fall outside the range of common support. See Appendix Figure 3.1 for a kernel density graph of the propensity score distribution by treatment and control groups.

I then applied the ATT weights to the OLS regressions depicted in equation (1). The weighted regressions include the full set of covariates used in the traditional OLS regressions. To address the fourth research question—whether the relationship between unintended birth and

child well-being varies by age—I include an interaction term between unintended birth and the child's age.

The weighted regression approach provides some advantages over traditional propensity score matching techniques. It is a doubly-robust method of balancing the data because it incorporates covariates into both the propensity score model and the weighted regressions. This supplemental parametric adjustment provides additional protection against model misspecification, and addresses any imbalance that remains after applying weights derived from the propensity scores (Morgan and Todd 2008; Robins and Rotnitzky 2001). This method also facilitates a straightforward application of survey weights to account for the study's complex sampling design, and allows me to adjust the standard errors for clustering (i.e., the fact that respondents contribute multiple observations that are not independent).

While the propensity score approach overcomes some limitations of traditional unweighted regression, both methods rely on selection on observables as an identification strategy. Estimates are therefore susceptible to bias due to unobservable characteristics that may differentiate parents who have intended and unintended births, although this concern is mitigated by the extensive and rich data available in the NLSY79 dataset. Fixed effects models that estimate within-person change over time are commonly used to address concerns about bias due to unobserved variables, but they are inappropriate for this study's research questions because a child's pregnancy intention status does not change over time. As previously mentioned, some studies have estimated sibling fixed effects models that compare intended and unintended siblings within in the same family, but this comparison likely results in underestimation of the effect of unintended birth due to the "spillover effects" that extend to all children in a family with an unintended birth.

Another viable methodological approach is a growth curve model, which estimates between-person differences in within-person patterns of change over time (Curran, Obeidat, and Losardo 2010; Raudenbush and Bryk 2002). As such, growth curve models are suited to evaluate *trajectories* of well-being for intended and unintended children over time, whereas the current approach primarily focuses on *levels* of well-being at different points in the life course, carefully adjusting for observable characteristics that are associated with selection into unintended birth. Growth curve models are also well suited for panel data because the standard errors account for the correlation between repeated observations over time. The current methodological approach uses a robust variance estimator to adjust for within-cluster correlation (Wooldridge 2002), which is powerful but slightly less robust than the standard error estimation in a growth curve model. Nonetheless, the current propensity score approach has many advantages, is well-suited to addressing concerns about selection on observable characteristics, and is an appropriate method for evaluating differences in average levels of child well-being by intention status.

RESULTS

Table 3.1 presents descriptive statistics for the full sample and by pregnancy intention. All descriptive statistics are weighted with sampling weights to account for the survey's complex sampling design. 70% of the mother-child pairs included a focal child who was intended at the time of conception, and 30% had an unintended focal child. Most of the unintended children were considered mistimed; 80% of unintended children were mistimed, while 20% were unwanted.

In general, mothers of intended children were more advantaged than mothers of unintended children; they were more likely to be white, more likely to have lived in a nuclear

family at age 14, about three years older when they gave birth to their first child, had higher AFQT scores, and a greater sense of control over their lives (as measured by the Rotter scale). Children resulting from intended pregnancies were much less likely to be born to unmarried parents compared to those resulting from unintended pregnancies. Unconditional differences in child well-being suggest that intended children were also better off than unintended children; intended children had a more emotionally supportive and cognitively stimulating home environment, demonstrated fewer behavior problems and anxious/depressed behavior, had higher cognitive test scores, and demonstrated fewer depressive symptoms as young adults.

Results from the naïve (unconditional) OLS regressions, conditional OLS regressions, and weighted OLS regressions using ATT weights derived from propensity scores are summarized in Table 3.2. The coefficients for unintended birth in the naïve and conditional models represent the average difference in well-being between unintended children and intended children. The coefficients for unintended birth in the ATT weighted models represent the average difference in well-being between unintended children and intended children whose mothers have characteristics that suggest they were likely to have an unintended birth.

Results in Table 3.2 indicate that unintended children age 0-14 experienced a poorer quality home environment compared to intended children, even after adjusting for maternal characteristics and other covariates in conditional OLS and ATT-weighted OLS models. Specifically, the ATT-weighted regressions indicate that unintended children had a less emotionally supportive home environment compared to intended children. Although the magnitude of the coefficient is small (about 12% of a standard deviation), it is noteworthy that pregnancy intentions have an independent relationship with the home environment net of a rich set of control variables, including whether the child was a nonmarital birth.

Despite these differences in the home environment, there is no evidence that pregnancy intentions are linked with behavior problems among children age 4-14 or cognitive test scores among children age 5-14 once the models account for background characteristics. Unconditional mean differences in these measures are largely explained by maternal and child background characteristics, as the coefficients are sharply attenuated and not statistically significant in the conditional OLS and ATT weighted regressions. These results suggest that selection plays a large role in initial differences in child behavioral problems and cognitive test scores; intended and unintended children had statistically similar levels of well-being on these measures once selection factors were taken into account.

Although there was no evidence that pregnancy intentions were related to behavioral and cognitive well-being among children ages 4-14, there is some evidence that unintended children experienced more depressive symptoms at later stages of the life course. Specifically, unintended children had more depressive symptoms compared to intended children at ages 14-30, and this disparity persists across models. While the coefficient is statistically significant, the magnitude of the association is somewhat small (about 13% of a standard deviation). The R^2 statistic also suggests that the model explains a relatively small portion of the variance in depressive symptoms (about 4%). Nonetheless, it is noteworthy that pregnancy intentions at the time of conception are associated with the longer-term mental health of the child, net of maternal characteristics and the mother's marital status at birth.

Finally, to test the hypothesis that the effect of unintended birth on child well-being varies over the life course I re-estimated all models with an interaction term for unintended birth and child's age. The results provided no evidence that the effect of unintended birth on the multiple measures of child development and well-being was moderated by child's age (results

not shown but available on request). This suggests that the negative relationship between unintended birth and emotional support from ages 0-14 and depressive symptoms from ages 14-30 remained constant over time.

ROBUSTNESS CHECK AND SENSITIVITY ANALYSES

Additional moderation analyses

It is possible that the relationship between pregnancy intentions and child well-being varies by race, socioeconomic status, or marital status at birth. To examine these possibilities, I estimated separate models that included interactions between unintended birth and race, the mother's education prior to her first birth, and marital status at birth (models not presented but available on request). I did not find any evidence for moderation by these factors.

Differentiating mistimed and unwanted children

Although the main analyses collapse mistimed and unwanted births into a single group of unintended births, there are some differences between these groups that merit attention. Appendix Table 3.6 presents descriptive statistics for mistimed and unwanted births. In general, the mothers of mistimed focal children are more advantaged than the mothers of unwanted focal children. Mothers of mistimed children are more likely to be white and less likely to be black. Mothers of mistimed children were more likely to have lived with both biological parents at age 14, more likely to have been raised Catholic, and had higher AFQT scores compared to mothers of unwanted focal children. Mistimed children were more likely to be first-born than unwanted children, as expected. Recall that a child is considered mistimed if the mother wanted a child at some point in the future, and a child is considered unwanted if the mother did not want any (more) children. As noted by Sable (1999), a young, unmarried mother may be more likely to classify her unintended pregnancy as mistimed if she hopes to get married and have a child at

some point in the future, however distant, while an older married woman who has achieved her desired family size might report an unintended pregnancy as unwanted because she did not want any more children.

Does collapsing mistimed and unwanted births into a single category obfuscate the consequences of unintended birth? To answer this question, I estimated conditional OLS regressions that differentiated mistimed and unwanted children, and conducted post hoc Wald tests to determine whether there were statistically significant differences between them (see Appendix Table 3.7). These results suggest that there is a statistically significant difference between mistimed and unwanted children in terms of the overall BPI and the anxious/depressed subscale of the BPI, but they are statistically similar on all other measures. Specifically, unwanted children demonstrated fewer behavior problems than both mistimed and intended children, net of mother's marital status at birth and other controls.

This result is somewhat unexpected, but some of the negative effects of unwanted birth may be explained by marital status at birth. In the current study, unwanted births are much more likely to be nonmarital compared to mistimed births. Models that did not adjust for nonmarital birth predicted less divergence between mistimed and unwanted births, although the pattern of results persisted (not shown but available on request). Recent research that examined the NLSY data and adjusted for the co-residence of a spouse or partner before the child's birth found a similar unexpected result; the negative effects of unintended birth were limited to mistimed children (Barber and East 2011). One potential explanation advanced by Barber and East is that unwanted births may be more likely to be aborted than mistimed births. Another potential explanation is that mistimed births exert stronger burdens on parents as a function of child spacing. For instance, a mother may classify her pregnancy as occurring sooner than intended if

there is another young child who requires intensive care.

Causal effect heterogeneity

I also examined the models for consequential causal effect heterogeneity (i.e., whether the potential consequences for unintended children vary for mothers who are more or less likely to have an unintended birth) (see, e.g., Brand and Xie 2010; Morgan 2001; Morgan and Todd 2008). I compared the effect of unintended birth among children born to mothers who typically have unintended births (average treatment effect for the treated, or ATT) to the effect of unintended birth among children born to mothers who typically have intended births (average treatment effect for the controls, or ATC). I assessed this causal effect heterogeneity by comparing the results from ATT and ATC weighted regressions using the diagnostic routine outlined by Morgan and Todd (2008). The results were substantively similar, which suggests that there is no consequential causal effect heterogeneity.

Sample selection

Due to the structure of the child and young adult sample, children born after 1996 do not contribute observations to the CES-D measure of depressive symptoms, children born after 2005 do not contribute observations to the PIAT cognitive test scores, and children born after 2006 do not contribute observations to the BPI. Although the models adjust for the child's birth year and age, comparisons across dependent variables may be misleading due to the shifting sample composition. To test the sensitivity of the models, I estimated all models among children born from 1979-1992, the portion of the sample that contributes observations to all dependent variables, including the CES-D at ages 20-30. Results from these models are nearly identical to results from models that leverage the full sample (not shown but available by request).

Mediation analysis

Why do 14-30 year old unintended children have more depressive symptoms than intended children, on average? One potential explanation consistent with attachment theory is that the poorer quality home environment from ages 0-14 mediates these longer term disparities in mental health. To explore this possibility, I estimated a model predicting depressive symptoms that also controlled for the average HOME scores from ages 0-14. Mediation is assessed by adding the HOME score to the model as a control variable and observing the degree of attenuation in the unintended birth coefficient. Although measures of cognitive stimulation and emotional support from ages 0-14 were statistically significant predictors of depressive symptoms at ages 14-30, there was no evidence that these factors mediated the relationship between unintended birth and depressive symptoms (not shown but available on request).

DISCUSSION AND CONCLUSION

Although much prior research focuses on family structure as a centrally important factor in child well-being, pregnancy intentions have become increasingly salient as the link between marriage and childbearing weakens. This study examined several metrics of child well-being among intended and unintended children, and provided evidence that pregnancy intentions have a distinct association independent of marital status. This study also extends prior research on pregnancy intentions and child well-being both methodologically and substantively. It contributes to a relatively small body of literature that examined the relationship between pregnancy intentions and development among children, adolescents, and young adults (Axinn, Barber, and Thornton 1998; Barber, Axinn, and Thornton 1999; Barber and East 2009; Barber and East 2011; Joyce, Kaestner, and Korenman 2000). Results from this study highlight the importance of considering pregnancy intentions in evaluations of child well-being.

The current study found that unintended children had a less emotionally supportive home

environment from ages 0-14 compared to intended children, on average. This finding is robust across different model specifications, including models that adjust for mother's marital status at birth and selection into unintended childbearing. This finding is also consistent with prior research that analyzed different data or used different modeling techniques (Barber, Axinn, and Thornton 1999; Barber and East 2009). Taken together, the current study and prior research provides consistent evidence that unintended children tend to have a poorer quality home environment than intended children. This raises some concerns about the longer term developmental implications for unintended children.

Despite these differences in the home environment, however, the current study found that intended and unintended children had statistically similar behavior problems from ages 4-14 once I adjusted for characteristics associated with selection into unintended childbearing. The results suggest that background characteristics explain the initial unconditional mean differences in behavior problems between intended and unintended children. This evidence is consistent with a prior study that examined fewer waves of NLSY data and limited their analysis to one observation of children's behavioral and cognitive outcome (Joyce, Kaestner, and Korenman 2000). The current study joins Joyce et al. in casting doubt on the causal link between pregnancy intentions and behavior problems among unintended children.

The current study also suggests that there is no relationship between pregnancy intentions and cognitive test scores among children age 5-14, after accounting for a rich set of characteristics associated with selection into unintended childbearing. These characteristics explained the initial unconditional association between unintended birth and lower math and reading comprehension scores. This is consistent with findings from Joyce and colleagues (2000), who failed to find a statistically significant relationship between pregnancy intentions

and PIAT cognitive test scores in any of the models they estimated.

This study provides some evidence of long-term consequences for unintended children, consistent with attachment theory. Namely, unintended children experienced more depressive symptoms at ages 14-30 compared to intended children. It is particularly striking that pregnancy intentions at the time of conception can be linked with the longer-term mental health of the child up to 30 years later, although the magnitude of the effect is small. This evidence bolsters prior research that found small but statistically significant differences in self-esteem between intended and unintended children at age 23 among a sample of children born to white married women in the Detroit metropolitan area in 1961 (Axinn, Barber, and Thornton 1998). Nonetheless, the models in the current study explain relatively little variation in depressive symptoms, which suggests that additional factors may be at play.

This study also tested the hypothesis that the association between unintended birth and child well-being would vary by age, and failed to find evidence of this type of moderation. One potential inconsistency with this finding is that the study did not find evidence of increased anxious/depressed behavior problems among unintended children ages 4-14, but did find increased depressive symptoms among unintended children ages 14-30. Although this might suggest that unintended birth has mental health consequences that do not appear until adolescence, it may also be due to the fact that depressive symptoms were measured with two different instruments for these age groups. The anxious/depressive behavior subscale of the Behavior Problem Index for 4-14 year olds is based on mother reports of children's behavior, whereas the depressive symptoms CES-D scale for 14-30 year olds is based on the children's reports of the frequency of clinical depressive symptoms. Although these measures are appropriate for measuring depressive symptoms among each respective age group, it is possible

that they are capturing slightly different dimensions of mental health.

The data and analytic approach of the current study overcome some of the methodological limitations of prior research. Selection bias is a key concern in studies of unintended birth and child well-being, because it is possible that there are characteristics associated with both selection into unintended birth and child well-being that threaten causal inference. The propensity score weighted regression approach in the current study facilitates a between-group comparison and does not restrict the sample to families with multiple children of different intention statuses (i.e., intended and unintended siblings), as in sibling fixed effects models. The sample in the current study includes focal children from a range of families, including those with only one child, and those with siblings who have the same intention status. Although some of the measures of well-being examined in the current study have been evaluated in these prior studies (PIAT cognitive test scores (Joyce, Kaestner, and Korenman 2000), BPI (Barber and East 2011; Joyce, Kaestner, and Korenman 2000), and HOME scores for emotionally supportive and cognitively stimulating home environment (Barber and East 2009; Barber and East 2011), the results in the current study provide additional evidence of the relationship between pregnancy intentions and well-being under different modeling assumptions and different subsamples.

The study also builds on prior research by examining the effects of pregnancy intentions on mental health when the children are adults. The current study draws on a nationally representative cohort sample that supports generalizable findings, whereas two prior studies on the long term effects of unintended birth on child well-being relied on samples of white married women who gave birth in 1961 in the Detroit metropolitan area (Axinn, Barber, and Thornton 1998; Barber, Axinn, and Thornton 1999). The weighted regression approach facilitates a

straightforward application of sampling weights that adjust for the study's complex survey design, which ensures that the results are representative of children born to the women in the NLSY79 cohort sample. The current study strengthens evidence from these prior studies by extending the findings to a nationally representative cohort sample and focusing on a unique dimension of mental health.

In sum, this study provides evidence that unintended children fare worse than intended children in terms of the home environment during their childhood and adolescence, and longer term mental health. At the same time, the magnitude of these disparities is small and there seems to be relatively little impact on dimensions of behavioral and cognitive development during adolescence. Nonetheless, given that unintended birth is associated poorer well-being among parents and children overall, this fertility pattern could serve as a vehicle for the reproduction of inequality and deserves further attention. The negative consequences of unintended birth might compound the relative disadvantage of the groups most likely to experience these births, and limit the economic and social resources that parents can extend to their children. In the long run, this might contribute to growing social disparities between children of different socioeconomic classes (McLanahan 2004; McLanahan and Percheski 2008).

Table 3.1. Descriptive statistics by mother's pregnancy intention of focal child

	Intended			Unintended			
	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.	
Maternal selection characteristics (prior to first birth)							
White	14144	0.82		8103	0.61		***
Black	14144	0.10		8103	0.30		***
Hispanic	14144	0.05		8103	0.05		
Other race	14144	0.03		8103	0.04		
Mom lived in the south (age 14)	14144	0.33		8103	0.38		*
Mom lived in urban area (age 14)	14144	0.77		8103	0.80		†
Foreign language spoken in HH (age 14)	14144	0.12		8103	0.12		
Mom lived in nuclear family (age 14)	14144	0.78		8103	0.64		***
No literacy materials in hh (mom age 14)	14144	0.15		8103	0.19		*
Mother raised Catholic	14144	0.37		8103	0.27		***
Mother raised liberal Protestant	14144	0.16		8103	0.14		
Mother raised conservative Protestant	14144	0.33		8103	0.44		***
Mother raised with no/other religion	14144	0.13		8103	0.16		
Grandmother's years of education (1979)	14144	11.58	2.66	8103	11.06	2.53	***
Mother's age at first birth	14144	25.33	5.12	8103	21.75	4.68	***
Mother AFQT score (percentile)	14144	52.24	27.87	8103	41.19	26.67	***
Rotter scale (1979)	14144	11.49	2.44	8103	11.16	2.42	*
Child characteristics							
Child is male	14144	0.51		8103	0.53		
Child is first-born	14144	0.52		8103	0.47		†
Nonmarital birth	14144	0.09		8103	0.42		***
Child's age at assessment	14144	10.87	6.73	8103	12.31	7.34	***
Child and young adult well-being outcomes							
Emotionally supportive home (age 0-14)	8296	101.94	14.03	4281	96.75	15.41	***
Cognitively stimulating home (age 0-14)	8765	102.31	13.30	4532	97.94	15.18	***
Child's Behavior Problem Index (4-14)	6883	102.66	14.57	3723	105.87	14.89	***
Child anxious/depressed scale (age 4-14)	7010	101.63	13.17	3805	103.38	13.19	**
PIAT Math score (age 5-14)	6051	106.32	13.70	3357	101.91	13.44	***
PIAT Reading comprehension (5-14)	5162	105.77	13.27	2855	101.83	13.30	***
Young adult depressive symptoms (14-30)	4714	4.22	3.61	3183	4.94	3.85	***

*** p<0.001, ** p<0.01, * p<0.05, † p<0.10; Asterisks indicate statistically significant difference between intended and unintended

Table 3.2. Summary of results predicting differences in child well-being between unintended and intended children

	Age 0-14		Age 4-14		Age 5-14		Age 14-30
	Emotionally Supportive Home Environment	Cognitively Stimulating Home Environment	Behavior Problem Index	Anxious/ Depressed sub scale of BPI	PIAT Math	PIAT Reading Comprehension	Depressive symptoms (CES-D)
Naïve OLS Regressions	-5.192***	-4.379***	3.209***	1.752***	-4.407***	-3.933***	0.717***
	(0.479)	(0.526)	(0.647)	(0.516)	(0.577)	(0.550)	(0.147)
Conditional OLS Regressions	-2.027***	-1.079*	0.668	0.210	-0.042	-0.379	0.496**
	(0.494)	(0.515)	(0.687)	(0.547)	(0.535)	(0.558)	(0.166)
ATT Weighted Regressions	-1.805***	-0.925	0.331	0.361	0.735	0.141	0.467**
	(0.519)	(0.574)	(0.703)	(0.554)	(0.580)	(0.608)	(0.174)
Conditional OLS Regressions							
Person-Year Obs	12,577	13,297	10,606	10,815	9,408	8,017	7,897
Unique N	2504	2518	2458	2461	2367	2314	2067
R^2	0.112	0.164	0.089	0.066	0.228	0.237	0.04
ATT Weighted Regressions							
Person-Year Obs	12,561	13,281	10,592	10,800	9,396	8,006	7,885
Unique N	2499	2513	2453	2456	2363	2310	2065
R^2	0.123	0.151	0.091	0.070	0.197	0.237	0.042

*** p<0.001, ** p<0.01, * p<0.05, † p<0.10

Robust standard errors in parentheses

All models are weighted to account for the survey's complex sampling design

Conditional models control for mother's race, characteristics of the mother's household at age 14 (lived in the south, urban residence, foreign language spoken in HH, nuclear family), mother's religion at birth (Catholic, liberal Protestant, conservative Protestant, none/other religion), grandmother's education in 1979, mother's age at first birth, mother's AFQT score (1980) , mother's Rotter score (1979), child's sex, whether the child was a first birth, whether the child was a nonmarital birth, child's age (in years), and dummy variables for child's year of birth.

ATT weighted regressions adjust for all variables included in the conditional model.

Appendix Table 3.1. Descriptive statistics, dropped vs. retained sample

	Dropped sample			Retained sample			
Variable	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.	
Intention status							
Intended	4708	0.66		22247	0.70		
Unintended	4708	0.34		22247	0.30		
Mistimed	4708	0.24		22247	0.24		
Unwanted	4708	0.10		22247	0.06		**
Maternal selection characteristics (prior to first birth)							
White	4708	0.61		22247	0.75		***
Black	4708	0.19		22247	0.16		†
Hispanic	4708	0.12		22247	0.05		***
Other race	4708	0.07		22247	0.03		**
Mom lived in the south (age 14)	3786	0.33		22247	0.35		
Mom lived in urban area (age 14)	4566	0.82		22247	0.78		†
Foreign language spoken in HH (age 14)	4690	0.22		22247	0.12		***
Mom lived in nuclear family (age 14)	4660	0.65		22247	0.74		**
No literacy materials in HH (mom age 14)	4708	0.16		22247	0.16		
Mother raised Catholic	4474	0.30		22247	0.34		
Mother raised liberal Protestant	4474	0.12		22247	0.16		†
Mother raised conservative Protestant	4474	0.41		22247	0.36		
Mother raised with no/other religion	4474	0.17		22247	0.14		
Grandmother's years of education (1979)	3194	10.92	3.44	22247	11.43	2.63	*
Mother's age at first birth	4708	22.97	5.15	22247	24.27	5.25	***
Mother AFQT score (percentile)	3799	36.59	29.65	22247	48.97	27.98	***
Rotter scale (1979)	4501	11.10	2.31	22247	11.39	2.44	*
Child characteristics							
Child is male	4708	0.54		22247	0.52		
Child is first-born	4708	0.44		22247	0.51		*
Child was born to unmarried mother	3320	0.24		22247	0.19		†
Child's age at assessment	4708	11.82	7.22	22247	11.30	6.95	**
Child and young adult well-being outcomes							
Emotionally supportive home (age 0-14)	2450	97.64	15.78	12577	100.52	14.60	***
Cognitively stimulating home (age 0-14)	2607	97.33	15.86	13297	101.12	13.98	***
Child's Behavior Problem Index (age 4-14)	2175	104.97	14.64	10606	103.57	14.73	†
Child anxious/depressed scale (age 4-14)	2217	102.22	12.75	10815	102.12	13.20	
PIAT Math score (age 5-14)	1856	102.23	14.75	9408	105.06	13.77	***
PIAT Reading comprehension score (5-14)	1542	102.29	14.05	8017	104.64	13.39	**
Young adult depressive symptoms (14-30)	1761	4.39	3.60	7897	4.47	3.71	

*** p<0.001, ** p<0.01, * p<0.05, † p<0.10

Appendix Table 3.2. Comparison of pregnancy intention estimates across studies using the NLSY79

Author	Sample	n	Intended	Unintended	Unwanted	Mistimed
Su (estimate)	Children born after 1978 with siblings (more than 1 child in family)	7,648 children	0.64	0.36	0.09	0.27
Barber & East 2011	Children with unintended younger sibling, valid DV before and after birth of sibling	2,976 children	0.66	0.34	0.07	0.27
Barber & East 2009	Women who experienced a live birth during survey	3,134 mothers and 5,890 children	0.63	0.37	0.10	0.27
Su (estimate)	Children born 1978-1992	7,624	0.61	0.39	0.10	0.30
Joyce et al. 2000	Children born 1978-1992	5,329	0.60	0.40	0.10	0.30
Su (estimate)	Mothers with a first birth by 1986	2,834	0.53	0.47	n/a	n/a
Rosenzweig & Wolpin 1993	Mothers who had a first birth by 1986	3,233	0.54	0.46	n/a	n/a
Su (estimate)	First born children born before 1984	2,381	0.55	0.45	n/a	n/a
Marsiglio & Mott 1988	Women who only had one child by 1984	1,518	0.55	0.45	n/a	n/a
Su (estimate)	Children born in 1984, 1985, or 1986	1,776	0.60	0.39	0.09	0.30
Baydar 1995	Children younger than 2 in 1986, one child randomly selected for each mom	1,327	0.61	0.39	0.05	0.34

Appendix Table 3.3. Propensity score model, predicting likelihood of unintended birth

	OR (SE)
Black	4.049*
	(2.531)
Hispanic	1.056
	(0.916)
Other race	0.799
	(0.992)
Mom lived in the south (age 14)	0.525
	(0.428)
Mom lived in urban area (age 14)	0.226†
	(0.188)
Foreign language spoken in HH (age 14)	1.377
	(0.331)
Mom lived in nuclear family (age 14)	0.744†
	(0.114)
No literacy materials in hh (mom age 14)	1.007
	(0.706)
Mother raised Catholic	0.809
	(0.344)
Mother raised liberal Protestant	1.550
	(0.754)
Mother raised conservative Protestant	0.656
	(0.250)
Grandmother's years of education (1979)	0.986
	(0.053)
Mother's age at first birth	0.844**
	(0.055)
Mother AFQT score (percentile)	1.045**
	(0.017)
Rotter scale (1979)	0.724*
	(0.108)
Nonmarital birth	5.242***
	(1.586)
First birth	0.794
	(0.533)
nonmarXblack	0.590†
	(0.179)
nonmarXhispanic	0.472†
	(0.192)

Appendix Table 3. (continued)

	OR (SE)
nonmarXothrace	0.377
	(0.231)
age1bXfirstbir	1.002
	(0.027)
nuclearXnonmar	1.503
	(0.396)
afqtXsouth	0.994
	(0.005)
afqtXgmaedu	1.000
	(0.001)
afqtXblack	0.999
	(0.006)
afqtXhispanic	1.008
	(0.008)
afqtXothrace	0.991
	(0.010)
afqtXcatholic	1.002
	(0.007)
afqtXlibprot	0.993
	(0.008)
afqtXconprot	1.007
	(0.007)
afqtXage1b	0.998**
	(0.001)
southXcatholic	0.712
	(0.304)
southXlibprot	0.917
	(0.432)
southXconprot	1.122
	(0.418)
southXage1b	0.998
	(0.029)
southXrotter79	1.085
	(0.059)
southXfirstbir	0.975
	(0.240)
rotterXblack	0.940
	(0.052)

Appendix Table 3. (continued)

	OR (SE)
rotterXhispanic	0.968
	(0.074)
rotterXothrace	1.071
	(0.119)
rotterXurban	1.097
	(0.066)
rotterXnolit	1.009
	(0.062)
rotterXage1b	1.010†
	(0.006)
urbanXgmaedu	1.043
	(0.057)
urbanXfirstbir	1.417
	(0.393)
Constant	43.109*
	(72.372)
Observations	22,247
Cluster	2549
Pseudo R^2	0.1844

Robust standard errors in parentheses
*** p<0.001, ** p<0.01, * p<0.05, † p<0.10

Appendix Table 3.4. Average of standardized mean and standard deviation differences between treatment and control

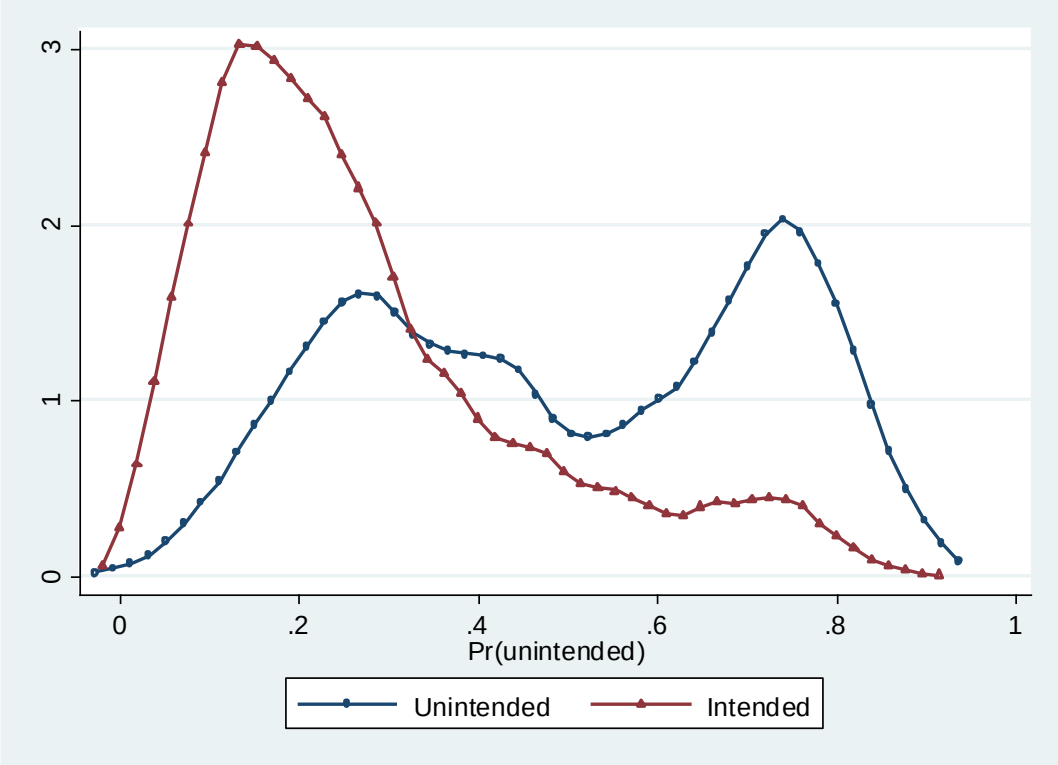
	Mean	Std. Dev.
Sampling weight	0.24	0.05
ATT weight	0.01	0.02

Appendix Table 3.5. Descriptive statistics weighted by ATT weights, by treatment and control groups

	Intended		Unintended	
Variable	Mean	Std. Dev.	Mean	Std. Dev.
ATT weights				
Black	0.30		0.30	
Hispanic	0.05		0.05	
Other race	0.04		0.04	
Mom lived in the south (age 14)	0.37		0.38	
Mom lived in urban area (age 14)	0.82		0.80	
Foreign language spoken in HH (age 14)	0.12		0.12	
Mom lived in nuclear family (age 14)	0.63		0.64	
No literacy materials in hh (mom age 14)	0.20		0.19	
Mother raised Catholic	0.28		0.27	
Mother raised liberal Protestant	0.13		0.14	
Mother raised conservative Protestant	0.44		0.44	
Grandmother's years of education (1979)	11.06	2.59	11.06	2.53
Mother's age at first birth	21.74	4.45	21.75	4.68
Mother AFQT score (percentile)	40.49	27.06	41.19	26.67
Rotter scale (1979)	11.20	2.42	11.16	2.42
Nonmarital birth	0.42		0.42	
First birth	0.47		0.47	

Note: there are no statistically significant differences between the treatment and control groups ($p < .001$) when weighted with ATT weights

Appendix Figure 3.1. Distribution of propensity score by pregnancy intention



Appendix Table 3.6. Weighted descriptive statistics for mistimed and unwanted children

	Mistimed			Unwanted			
	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.	
Maternal selection characteristics (prior to first birth)							
White	6241	0.64		1862	0.48		**
Black	6241	0.28		1862	0.41		**
Hispanic	6241	0.05		1862	0.07		
Other race	6241	0.04		1862	0.05		
Mom lived in the south (age 14)	6241	0.37		1862	0.45		†
Mom lived in urban area (age 14)	6241	0.81		1862	0.78		
Foreign language spoken in HH (age 14)	6241	0.13		1862	0.12		
Mom lived in nuclear family (age 14)	6241	0.66		1862	0.58		
No literacy materials in hh (mom age 14)	6241	0.18		1862	0.25		†
Mother raised Catholic	6241	0.29		1862	0.20		*
Mother raised liberal Protestant	6241	0.14		1862	0.13		
Mother raised conservative Protestant	6241	0.43		1862	0.45		
Mother raised with no/other religion	6241	0.14		1862	0.22		†
Grandmother's years of education (1979)	6241	11.17	2.40	1862	10.63	2.94	*
Mother's age at first birth	6241	21.80	4.48	1862	21.56	5.42	
Mother AFQT score (percentile)	6241	42.94	26.59	1862	34.03	25.81	**
Rotter scale (1979)	6241	11.18	2.42	1862	11.09	2.41	
Child characteristics							
Child is male	6241	0.54		1862	0.49		
Child is first-born	6241	0.49		1862	0.38		*
Nonmarital birth	6241	0.38		1862	0.59		***
Child's age at assessment	6241	12.47	7.37	1862	11.67	7.16	**
Household composition and economic resources (measured at assessment)							
Mother is married	6081	0.59		1813	0.44		***
Mother is separated/divorced/widowed	6081	0.25		1813	0.28		
Mother never married	6081	0.16		1813	0.27		**
Number of mother's spouses/partners	6100	1.33	0.86	1817	1.19	0.79	*
HH income	5245	62.14	80.75	1525	50.22	73.25	*
Below the poverty line	5272	0.18		1530	0.31		***
Child and young adult well-being outcomes							
Emotionally supportive home (age 0-14)	3275	97.58	15.04	1006	93.48	16.38	***
Cognitively stimulating home (age 0-14)	3445	98.78	14.75	1087	94.70	16.33	**
Child's Behavior Problem Index (age 4-14)	2870	106.43	14.72	853	103.60	15.33	*
Child anxious/depressed scale (age 4-14)	2923	103.99	13.20	882	100.95	12.88	**
PIAT Math score (age 5-14)	2581	102.23	13.02	776	100.63	14.97	
PIAT Reading comprehension score (age 5-14)	2196	102.24	13.28	659	100.20	13.24	†
Young adult depressive symptoms (age 14-30)	2504	4.92	3.83	679	5.04	3.95	

*** p<0.001, ** p<0.01, * p<0.05, † p<0.10

Asterisks indicate statistically significant difference between Mistimed and Unwanted

Appendix Table 3.7. Summary of regression results predicting child well-being, differentiating mistimed and unwanted births

	Age 0-14		Age 4-14		Age 5-14		Age 14-30
	Emotionally Supportive Home Environment	Cognitively Stimulating Home Environment	Behavior Problem Index	Anxious/ Depressed sub scale of BPI	PIAT Math	PIAT Reading Comp	Depressive symptoms (CES-D)
Mistimed	-1.818***	-0.953†	1.194	0.717	-0.111	-0.374	0.492**
	(0.516)	(0.532)	(0.731)	(0.584)	(0.556)	(0.588)	(0.170)
Unwanted	-2.971**	-1.646	-1.742[a]	-2.078*[a]	0.270	-0.405	0.521
	(0.904)	(1.005)	(1.142)	(0.843)	(1.006)	(0.943)	(0.325)
Constant	100.453***	85.248***	119.541***	97.538***	75.036***	80.060***	5.908***
	(3.945)	(3.136)	(6.060)	(7.718)	(3.531)	(4.704)	(0.894)
Obs-ervations	12,577	13,297	10,606	10,815	9,408	8,017	7,897
R-squared	0.113	0.164	0.090	0.068	0.228	0.237	0.040
Cluster	2504	2518	2458	2461	2367	2314	2067

*** p<0.001, ** p<0.01, * p<0.05, † p<0.10

Robust standard errors in parentheses

[a] Statistically significant difference between mistimed and unwanted, p<.05

All models are weighted to account for the survey's complex sampling design

Conditional models control for mother's race, characteristics of the mother's household at age 14 (lived in the south, urban residence, foreign language spoken in HH, nuclear family), mother's religion at birth (Catholic, liberal Protestant, conservative Protestant, none/other religion), grandmother's education in 1979, mother's age at first birth, mother's AFQT score (1980) , mother's Rotter score (1979), child's sex, whether the child was a first birth, nonmarital birth, child's age (in years), and dummy variables for child's year of birth.

CHAPTER 4: POSTCONCEPTION COHABITATION, HOUSEHOLD ENVIRONMENT, AND CHILD DEVELOPMENT

The link between marriage and childbearing has weakened over time, as evidenced by dramatic increases in nonmarital childbearing and increasingly diverse family forms (for a review see Smock and Greenland 2010). The increasing nonmarital birth rate does not necessarily imply that all children born to unmarried parents are being raised by single parents, however (Raley 2001). Over the past few decades, increases in nonmarital births have been driven by increases in births to cohabiting couples (Bumpass and Lu 2000; Kennedy and Bumpass 2008). From 2006-2010, 22% of first births were to cohabiting women, compared to just 12% in 2002 (Martinez, Daniels, and Chandra 2012). Cohabiting births accounted for nearly 60% of all nonmarital births in 2006-2008 (Lichter 2012). This suggests that cohabitation has become a more common context in which to raise children, particularly among Hispanics and non-Hispanic whites. Among Hispanics, over two thirds of nonmarital births (70.2%) were to cohabitors, compared to 61.3% among non-Hispanic whites and 37.7% among non-Hispanic blacks (Lichter 2012).

Recent research provides evidence that cohabitation is also an increasingly common response to nonmarital pregnancies (Rackin and Gibson-Davis 2012; Raley 2001). The prevalence of postconception, pre-birth (i.e., "shotgun") marriage has decreased dramatically over time. In the early 1960s, 60% of women with nonmarital conceptions married before the birth of their first child, compared to just 23% in the early 1990s (Bachu 1999). At the same time, there has been significant growth in postconception, pre-birth cohabitation. Estimates from the 2006-2008 National Survey of Family Growth (NSFG) indicate that nearly 21% of single, non-cohabiting women with nonmarital conceptions were in postconception cohabitations at the

time of birth, compared to about 7% in postconception marriages (Lichter 2012). For economy of expression, hereafter I refer to relationships formed after conception but before the birth as postconception marriages and cohabitations.

As postconception cohabitations have become more prevalent, particularly among racial and ethnic minorities and low-educated women (Gibson-Davis and Rackin 2012; Lichter 2012), the developmental implications for children have become more important. Research has generally found that children born to cohabiting biological parents fare worse than children born to married biological parents in terms of cognitive tests, behavioral and emotional problems, school engagement, and economic resources (Artis 2007; Brown 2004; Manning and Brown 2006). Furthermore, this research showed that two-parent cohabiting families didn't offer any appreciable benefits for children over other family forms, such as cohabiting step-families, married step-families, or single parents. Although these studies shed light on families with biological cohabiting parents, they did not evaluate whether the timing of the cohabitation relative to conception was relevant to child well-being. It is therefore unclear whether this demographic shift has broader consequences for child well-being. If postconception cohabitation is associated with poorer child well-being, it is possible that disproportionate rates of postconception cohabitation among disadvantaged populations could contribute to the diverging destinies of children from different social classes (McLanahan 2004).

It is also necessary to acknowledge heterogeneity within cohabiting families as it becomes a more common family arrangement. It is possible that postconception cohabitors provide a different home environment than cohabiting couples who were co-residing before having a child. Postconception cohabitations might offer a unique context for parenting because these relationships may be motivated by the impending arrival of a child rather than the

deepening commitment of the romantic relationship (Reed 2006). In other words, these relationships might signify a more significant commitment to the role of parent rather than the role of partner. They may be beneficial insofar as they allow parents to more easily share child care, household, and financial responsibilities, but they might also be more fragile and prone to dissolution than relationships formed prior to conception. Alternatively, as postconception cohabitation becomes more common and cultural norms shift, it may be also considered an acceptable environment for childrearing and serve as a functional alternative to postconception marriage (Cherlin 2004). In this context, parents might jointly decide to have a child and begin cohabiting at the same time (Musick 2007). If this is the case, postconception cohabitors might enjoy the benefits of sharing household and financial responsibilities without the greater risk of relationship dissolution. An examination of postconception cohabitations also facilitates a better understanding of whether the *timing* of the union formation vs. the *type* of union itself is more salient for child well-being.

STUDY OBJECTIVES

The current study begins to answer the call for more attention to children born into cohabiting families with two biological parents (Brown 2004; Manning and Lamb 2003; Manning and Brown 2006) by acknowledging postconception cohabitation as a distinct type of two-parent cohabitation. It complements a small but growing body of research on two-biological-parent cohabitation (Artis 2007; Brown 2004; Manning and Brown 2006) and demographic research on the growing trend of postconception cohabitation (Gibson-Davis and Rackin 2012; Lichter 2012; Rackin and Gibson-Davis 2012) by examining the linkages between postconception cohabitation and children's well-being. Specifically, this study considers the link between the parent's relationship status at birth and several measures of well-

being among children ages 3-11 by comparing postconception cohabitation to other family forms, including (a) preconception cohabitation, (b) postconception marriage, (c) preconception marriage, and (d) biological parents who were not married or cohabiting at birth. [4]

Contrasting postconception cohabitation with these family structures addresses four specific research questions. The first research question compares pre- and postconception cohabitors. Are children born to preconception cohabitors any better or worse off than those born to parents who moved in after the conception but before the birth, on average? Because both groups of children experience the same family structure at birth, this comparison allows me to examine whether the *timing* of the union relative to conception has implications for child well-being.

Next, I examine whether children born to postconception cohabitors fare better or worse than children born to parents in postconception marriages. In both cases, the parents' relationship is formed in response to a nonmarital conception. Postconception marriages have declined dramatically over time while postconception cohabitations have become more prevalent, particularly among populations with low education (Lichter 2012; Rackin and Gibson-Davis 2012), and this contrast allows me to assess the implications of this demographic shift for child well-being. It also allows me to assess the salience of the *type* of union for child well-being.

The third research question examines the well-being of children born to postconception cohabitors relative to children born to parents who married prior to conception, which is

[4] There are likely large racial differences in the relationship between postconception cohabitation and child well-being. Postconception cohabitation is more prevalent among Hispanics and non-Hispanic whites (Lichter, 2012), and there is evidence that the relationship between family structure and child well-being varies by race (Dunifon & Kowaleski-Jones, 2002; Fomby & Cherlin, 2007). Although the analyses in the current study account for race and ethnicity, limited sample size precludes a more detailed analysis of racial differences in the relationship between postconception cohabitation and child well-being.

considered the "gold standard" for child development and well-being. Do children fare better on average when they are born to parents in a traditional preconception marriage rather than postconception cohabitations?

The fourth research question examines whether children born to postconception cohabitors fare better or worse than parents who do not form a marital or cohabiting relationship. According to recent data, the vast majority of U.S. women who were not cohabiting and unmarried at conception remained single at birth (71.8%) (Lichter 2012). This comparison therefore reveals whether postconception cohabitation is associated with improved child well-being relative to the most common family arrangement for parents with nonmarital conceptions.

PRIOR RESEARCH ON POSTCONCEPTION COHABITATION

A small body of empirical and qualitative research has documented demographic trends and characteristics of postconception cohabitation. These studies provide important information about postconception cohabitation, and the current study builds on this literature by examining the implications of these trends for child well-being.

Norms about nonmarital pregnancies and single parenthood have shifted over time, as evidenced by the decline in postconception marriages and the increase in postconception cohabitations. Drawing on recent data from the 2006-2008 NSFG, Lichter (2012) confirmed that postconception cohabitations are much more common than postconception marriages among women with nonmarital conceptions (21% vs. 7%, respectively). Growth in postconception cohabitation is not evenly distributed across the population, however; it is concentrated among relatively disadvantaged populations. A study by Gibson-Davis and Rackin (2012) demonstrated socioeconomic stratification in the shift toward postconception cohabitation. Their analysis of NSFG data from 1985-2010 revealed that decreases in postconception marriage and increases in

postconception cohabitation were concentrated among women with lower levels of education. There is also significant ethnoracial variation in postconception cohabitation; in 2006-2008, 31% of Hispanic, 20% of non-Hispanic white, and 14% of non-Hispanic black women with nonmarital conceptions entered into postconception cohabitations (Lichter 2012).

Drawing on a nationally representative cohort sample of men and women who were ages 12 -16 in 1997, Rackin and Gibson-Davis (2012) examined the characteristics of parents who select into postconception cohabitation and found that, on average, postconception cohabitors were less socioeconomically advantaged compared to married parents, but more advantaged than single parents. Pre- and postconception cohabitors were demographically similar in terms of age at first birth, religious attendance, and education at first birth. They found slight divergence in race and education; postconception cohabitors were more likely to be Hispanic and more likely to be currently enrolled in school.

In addition to examining the characteristics of parents who entered into postconception cohabitation, the authors estimated rates of dissolution among pre- and postconception relationships, which gives some indication of the stability of these relationships. They found slightly higher rates of dissolution among postconception cohabitors overall; 62% of preconception cohabitations and 57% of postconception cohabitations remained intact three years after the birth. This average survival estimate obscures significant fragility among racial and ethnic minorities, however. Among Black parents, 58% of preconception cohabitations remained intact at three years compared to 45% of postconception cohabitations. Among Hispanics, 70% of preconception cohabitations remained intact at three years, compared to just 54% of postconception cohabitations. It is noteworthy that postconception cohabitation is much more fragile than preconception cohabitation among Hispanics, the racial/ethnic group that is

more likely to enter into this type of arrangement.

Qualitative research provides insight into why couples enter postconception cohabitations. A qualitative study drawing on interviews with 44 cohabiting couples with children from the Time, Love and Cash in Couples with Children study found that the vast majority of parents in the sample began cohabiting in response to a nonmarital pregnancy (73%) (Reed 2006). These couples reported that cohabiting allowed them to co-parent while avoiding the commitment of marriage. They enjoyed the practical convenience of sharing parenting and household expenses, but also valued the fact that their relationship could be easily dissolved if necessary. Most couples indicated that they planned to marry eventually, but many also experienced problems with insufficient financial resources, infidelity, domestic violence, or general mistrust.

Taken together, past research suggests that postconception cohabitation is a potentially unique situation relative to the more common scenario in which cohabitation begins prior to conception[5]. Although preconception and postconception cohabitors are demographically comparable, the relationship formation process is potentially dissimilar and may have implications for child well-being. The decision to enter a postconception cohabitation may be framed as a parenting choice, while the decision to form a preconception cohabitation may be viewed as a relationship choice. Postconception cohabitations may be beneficial insofar as they allow parents to more easily share child care, household, and financial responsibilities, but they might also be more fragile and prone to dissolution than relationships formed prior to conception. This household environment may have important implications for child well-being.

Selection bias

[5] Estimates from the 2006-2008 NSFG indicate that among births to cohabiting couples, only 21% were to postconception cohabitors (Lichter 2012).

Alternatively, it is possible that associations between postconception cohabitation and child well-being are not causal, but are due to factors that are associated with both family structure and child outcomes. In other words, children in postconception cohabitations might experience variations in well-being as a function of their parents' socioeconomic status, race, or other unobserved characteristics rather than the family structure at the time of birth. For example, parents who have a nonmarital conception and enter into a postconception cohabitation may be less stable or family oriented than married parents, and child well-being may be linked to these characteristics rather than the family structure *per se*. Men and women in postconception cohabitations are younger at first birth, have lower educational attainment, and are more likely to be racial or ethnic minorities compared to adults in preconception marriages, but have similar characteristics as those in preconception cohabitations and postconception marriages (Rackin and Gibson-Davis 2012). Given the demographic profile of postconception cohabitors, we might expect children born into this family arrangement to experience poorer well-being relative to those born to married parents, similar well-being relative to those born to preconception cohabitors, and better well-being relative to those born to single parents. If family structure is not a causal mechanism, we would also expect these associations to disappear once we account for the types of people who are likely to enter into these types of family structures.

PRIOR RESEARCH ON COHABITATION AND CHILD WELL-BEING

Prior research has examined associations between cohabitation and child development, but has not differentiated between pre- and postconception cohabitation. As mentioned previously, children born to cohabiting biological parents tend to fare worse than children born to married biological parents, and similar to children with cohabiting step-parents, married step-parents, and single parents in terms of cognitive tests, behavioral and emotional problems, and

school engagement (Artis 2007; Brown 2004; Manning and Brown 2006).

Research has also evaluated linkages between cohabitation and the household environment, such as economic resources, the quantity and quality of parenting, and family stability. Although children in cohabiting families generally enjoy more economic resources than children in single-parent families, they have fewer resources when compared to children in married-parent families (Manning and Lichter 1996). This might be due to the fact that parents who enter into cohabiting relationships have lower education, wages, and employment than those who enter into marriages (Sigle-Rushton and McLanahan 2002). Cohabiting couples are also less likely than married couples to pool their income or maintain joint bank accounts (Addo and Sassler 2010; Oropesa, Landale, and Kenkre 2003). Indeed, cohabiting couples report that limited economic resources are a significant barrier to marriage (Smock, Manning, and Porter 2005).

Research generally suggests that cohabiting parents exhibit slightly more negative parenting behavior compared to married-parent families (Hofferth and Anderson 2003; Thomson, Hanson, and McLanahan 1994). Furthermore, one study found that cohabiting biological fathers spent 3.7 fewer hours per week with their children than married biological fathers (Hofferth and Anderson 2003). Nonetheless, differences in parenting behavior do not seem to explain differences in the cognitive and behavioral development of children in cohabiting and married-parent families (Dunifon and Kowaleski-Jones 2002; Thomson, Hanson, and McLanahan 1994).

There is evidence that cohabiting relationships are less stable relative to marriage overall. Empirical estimates suggest that most children who are born to or ever live in a cohabiting family will experience a change in family structure within a few years (Graefe and Lichter 1999).

Indeed, children born to cohabiting parents experience more instability than children born to single parents and married biological parents (Cavanagh and Huston 2006; Raley and Wildsmith 2004). This instability may be attributed to the fact that cohabitation is not as institutionalized as marriage, and commitment to the relationship isn't as strongly reinforced by social norms or laws (Cherlin 2004). Postconception cohabitations may be particularly fragile (Rackin and Gibson-Davis 2012), which may have negative implications for child well-being (Cavanagh and Huston 2008; Fomby and Cherlin 2007; Osborne and McLanahan 2007).

This study's conceptual model links the biological parents' relationship status at birth to later child outcomes, even if the parents do not remain partnered. I argue that the relationship status at birth gives some indication of the family structure trajectory, which has implications for child well-being. Indeed, prior research suggests that family instability is related to family structure at birth (Cavanagh and Huston 2006). If a child is born to parents in a particularly fragile union they are more likely to experience a great deal of family instability as they grow (Cherlin 2009). This instability is therefore conceptualized as part of the effect of relationship status at birth. Children may witness several relationship transitions, such as the dissolution of their parents' relationship and subsequent re-partnering. These transitions are linked to poor child well-being (Cavanagh and Huston 2006; Cherlin 2009; Fomby and Cherlin 2007), and are not captured by simply observing the parents' current relationship status.

STUDY HYPOTHESES

Prior research and theory informs several hypotheses for the research questions evaluated in this study. The first research question evaluates the well-being of children born to postconception cohabitors relative to those born to preconception cohabitors. This contrast allows me to assess whether the *timing* of the relationship has implications for child well-being.

If the impending pregnancy motivated the parents to enter into a more serious relationship than they otherwise would have considered, we might find a negative relationship between postconception cohabitation and child well-being. Mothers facing a nonmarital conception might settle for poorer quality partners if they feel social pressure to live with the child's biological father or want the opportunity to share child care responsibilities. If postconception cohabitation reflects a deepening commitment to the parenting role but not to the adult relationship, it is possible that it is associated with increased family instability and, in turn, poorer child well-being. Alternatively, parents may view cohabitation as an appropriate alternative to marriage and might jointly decide to have a child and begin cohabiting (Musick 2007). Under this scenario we would expect children of pre- and postconception cohabitors to have similar well-being. Moreover, pre- and postconception cohabitors are demographically similar (Rackin and Gibson-Davis 2012) and their children experience the same family structure at birth, which would also suggest no difference in child well-being.

The second research question evaluates postconception cohabitation relative to postconception marriage, and allows me to assess whether the *type* of relationship is salient for child well-being. A preliminary hypothesis is that postconception marriage is associated with improved well-being relative to postconception cohabitation, in part due to increased family stability. Although both relationships are formed in response to a nonmarital conception, parents who enter into marriages may signal a stronger commitment to their romantic partner. Marriage is a more institutionalized family structure that is strengthened by legal and social norms (Cherlin 2004). Indeed, studies suggest that cohabiting relationships are generally less stable and lower quality than marriages (Osborne and McLanahan 2007; Wu and Musick 2008).

The third research question evaluates postconception cohabitation relative to

preconception marriage, which is considered the optimal context for raising children. The initial hypothesis is that preconception marriage is associated with significantly better well-being relative to postconception cohabitors because parents in these marriages tend to have higher socioeconomic status and children benefit from their social and financial resources. Additionally, parents in preconception marriages tend to have more stable unions than postconception cohabitors because their relationships are more institutionalized (Cherlin 2004).

The fourth research question evaluates the well-being of children born to postconception cohabitors relative to those born to parents who did not form a marriage or cohabitation. The initial hypothesis is that cohabitation will be associated with better child well-being compared to these unpartnered parents, in part because this arrangement facilitates a more equitable division of labor in terms of child care and financial responsibilities. In addition, single parents may be more likely to form and dissolve more relationships, exposing children to more partnership transitions and family instability.

METHOD

Data and Sample

Analyses for this paper draw on data from the Fragile Families and Child Well-Being Study (FFCWS). The FFCWS is a longitudinal birth cohort study of 4,898 children born between 1998 and 2000 in 20 large U.S. cities with populations of 200,000 or more people (see Reichman et al. 2001 for a detailed description of the sampling design). The FFCWS includes an oversample of nonmarital births, which provides a unique opportunity to explore postconception cohabitation. Mothers were initially interviewed in the hospital within two days of the focal child's birth, and follow-up interviews were completed when the focal child was approximately one, three, five, and nine years old. Of particular interest to this analysis, the FFCWS survey

collected detailed measures about the parents' relationship history as well as behavioral and cognitive assessments for the focal child at the age 3, 5, and 9 follow-up interviews.

The sample for this study excludes mothers who did not participate in any of the age 3, 5, or 9 follow-up surveys (n=646), did not have a valid response for at least one of the dependent variables evaluated in the analyses (n=94), were missing information about their relationship status at birth (n=353)[6], did not live with the child at least half time (n=219), or if the child's father was deceased (n=87). The eligible sample is n=3,499 unique respondents (71% of sample interviewed at birth). The sample for this study is pooled such that respondents contribute an observation for each wave in which they were interviewed. Each respondent can contribute up to three observations; 70% of the sample contributed 3 observations, 23% contributed two observations (age 3 and 5, age 3 and 9, or age 5 and 9), and 7% contributed only one observation. The total analytic sample is n=8,218 person-year observations.

Sixty five percent of the analytic sample had complete data for all control variables included in the analyses, and missing data were multiply imputed by chained equations (Rubin 1987). Most control variables had very few missing responses (0-3% missing), with the exception of father's age and employment (18-19% missing). Data that were missing due to attrition were not imputed. Respondents with missing data for the children's behavior problems and cognitive test score dependent variables were included in the imputation but excluded from the analytic sample (von Hippel 2007).

Measures

[6] Relationship status at birth is ambiguous for n=58 respondents. These cases have conflicting information in the variable for relationship status at birth (constructed by the FFCWS based on respondent reports and household roster at the baseline interview) and the start date of their marriage or cohabitation (respondent reported date at the age 1 follow-up interview). The discrepant cases reported being married or cohabiting at baseline, but at the age 1 interview reported that the relationship started after the baseline interview. I have classified these cases as "not married/cohabiting at birth" to retain as much sample as possible. Regression results do not significantly change when these cases are excluded from the sample.

Independent variables. The key independent variable in this analysis is the biological parents' relationship status at the time of the focal child's birth, and the timing of their relationship formation relative to conception. This categorical variable indicates whether, at the time of the birth, the child's parents were in a (a) postconception cohabitation (defined below), (b) preconception cohabitation, (c) postconception marriage, (d) preconception marriage, or (e) not married or cohabiting. This variable is coded using a constructed variable that reflects the mother and father's relationship status at the time of the child's birth, the start date of the mother and father's cohabitation or marriage, and the child's birth date. The constructed variable for relationship status at birth combines information from the mother about her marital status, cohabitation status (including information from a household roster), and a description of her current relationship with the child's father. The start date of cohabitation or marriage is collected at the age 1 follow-up interview; mothers who were cohabiting with or married to the child's father at birth or at the age 1 interview were asked to report the date they started living together or got married. The child's birth date is proxied by the baseline interview date, which took place in the hospital within two days of the child's birth. Following prior research (Rackin and Gibson-Davis 2012; Raley 2001), postconception cohabitation is defined as a cohabiting relationship between the child's biological parents that was formed zero to seven months before the child's birth and remained intact at the time of birth. Preconception cohabitation is defined as cohabitation that began 8 or more months prior to the birth of the focal child. Similarly, postconception marriages were formed zero to seven months prior to the child's birth and preconception marriages were formed eight or more months before the child's birth.

Note that there is some potential error in the conceptualization of these relationship measures because we do not know the actual date of conception. For example, if parents begin

cohabiting immediately after finding out about a pregnancy (around four weeks gestation) they could be erroneously categorized as preconception cohabitors, resulting in artificially low estimates of postconception cohabitation. If a child is born prematurely, parents could be incorrectly categorized as postconception cohabitors, resulting in inflated estimates of postconception cohabitation. Nevertheless, this coding approach is the best approximation of relationship formation relative to conception given that the conception date is not available. The slippage is likely minimal, and this method of identifying pre- and postconception relationships has been used in prior research (Bachu 1999; England, Wu, and Shafer 2012; Ginther and Zavodny 2001; Rackin and Gibson-Davis 2012; Raley 2001).

There is also some potential measurement error in the reported dates of cohabitation. Cohabitation is a less institutionalized family structure than marriage, and the start and end dates may be more fluid (Manning and Smock 2005). As a result, couples may have difficulty pinpointing the date they began cohabiting. There are also some concerns about the quality of retrospective reports of cohabitation in surveys, which may lead to artificially low cohabitation rates (Hayford and Morgan 2008). Indeed, prior research demonstrated that about 12% of Fragile Families survey respondents revised their reports about cohabitation between the baseline and age 1 follow-up surveys (Teitler, Reichman, and Koball 2006). Nonetheless, there is reason to believe that the measure of postconception cohabitation in the current study is a valid metric for the research objectives. The current study's measure of cohabitation relies on both contemporaneous and retrospective reports, which is in line with the recommendation of Teitler and colleagues (2006). Furthermore, the retrospective report is lagged only one year for parents in postconception relationships, which minimizes concern about the quality of retrospective data. Finally, reports may be more accurate for parents in postconception relationships because the

beginning of their cohabitation is linked to the pregnancy, a significant milestone. If respondents do under-report cohabitation, the results will provide a conservative estimate of the relationship between postconception cohabitation and child well-being.

Note that there is some heterogeneity within the group of mothers who were not married or cohabiting at the time of birth. For example, mothers in this group had varying degrees of contact with the child's biological father at the time of birth: 68% of these parents were "visiting" with the biological father (romantically involved but not cohabiting), 15% were friends, and 17% had little to no contact. Although unlikely, it is also possible that these mothers were in a relationship with someone other than the biological father at the time of birth. For these reasons I intentionally refer to this group as "not married or cohabiting" with the child's biological father rather than "single."

Dependent variables. Child well-being is assessed with several variables that measure child development and household environment. Child behavior is measured with the *anxious/depressed* and *aggressive* subscales of the Child Behavior Checklist (CBCL) (Achenbach 1992; Achenbach and Rescorla 2000). Mothers are asked to rate their child's behavior in the past two months by indicating whether each item is never true (0), somewhat or sometimes true (1), or very true or often true (2). The anxious/depressed scale consists of items such as being fearful, clingy, feeling unloved, or feeling sad, and the aggressive scale consists of items such as being defiant, arguing, being disobedient, and destroying things. The items are averaged to create the overall scale, with higher values indicating more behavior problems.

Child's cognitive development is assessed with the Peabody Picture Vocabulary Test (PPVT). The child's PPVT score is standardized by age. Note that the sample size for the child's PPVT score is smaller than the mother-reported CBCL measures; only about 78% of

FFCWS respondents who completed the in-home interview also completed the activity booklet, which included the child's PPVT assessment.

Economic resources are measured with a continuous variable of *household income* in the year prior to the child assessment, expressed in thousands of dollars. Household income includes the respondent's income as well as the income of everyone else who lives with the respondent, which should capture the income of a cohabiting partner. There is also a dichotomous variable that indicates whether the mother received *welfare* benefits in the prior year.

The *Aggravation in Parenting* scale is derived from questions in the Parenting Stress Inventory (Abidin 1995). Mothers report how strongly they agree with items such as "being a parent is harder than I thought it would be" and "I feel trapped by my responsibilities as a parent" using a four-point scale that ranges from 1=strongly agree and 4=strongly disagree. Responses were reverse-coded and averaged so that higher scores indicate increased aggravation in parenting.

Father involvement is a mother report of how often the father spent one or more hours per day with the child over the past month using a 1-5 scale where 1 indicates "*(nearly) every day*" and 5 indicates "*not at all*." The scale is reverse-coded so a higher score indicates more frequent father involvement.

Relationship dissolved is a dichotomous variable that indicates whether parents who were married or cohabiting at the time of the child's birth had dissolved their relationship at the time of the child's assessment (at age 3, 5, and/or 9). Parents who dissolved their marriage or cohabitation were coded as "1," and parents who did not dissolve a marriage or cohabitation were coded as "0." Parents who were not married or cohabiting at birth are not included in this measure because they did not have a relationship to dissolve at baseline.

Partner transitions are the number of the mother's romantic partnership changes between the child's birth and the time of child assessment. Following the approach employed by Osborne and McLanahan (2007), this variable captures the formation and dissolution of romantic relationships and is not limited to coresidential relationships. For example, if the child's biological parents were dating at the child's birth and cohabiting at the age 1 interview, the mother did not experience a partner transition. If the mother was cohabiting with the biological father at the age 1 interview and had a new partner at the age 3 interview, she experienced two transitions: the dissolution of the relationship with the biological father and the formation of the relationship with the new partner. Mothers who reported having a child with a new partner between interviews but were not in a relationship at either wave are coded as having two transitions (the beginning and ending of that relationship).

Note that partner transitions are coded based on the relationship status reported at each wave. The FFCWS did not collect information about partnerships that began and ended between interviews until the age 5 follow-up interview. To maintain consistency across waves I estimated partnership transitions based on the reported relationships at each wave. As a result, this variable might undercount the number of partnership transitions and therefore provides a conservative estimate of family stability[7].

Control variables.

The analyses adjust for characteristics that are potentially associated with both postconception cohabitation and child well-being. Adjusting for these characteristics allows me

[7] To get a sense of the degree to which the estimation method undercounts relationship transitions, I compared the estimated average partnership transitions to the self-reported partners between waves at age 5 and age 9. At the age 5 interview, respondents self-reported an average of 0.51 partners between age 3 and age 5, while the estimated partnership transitions based on relationship status at each wave yielded an average of 0.46 transitions. At the age 9 interview, respondents reported an average of 0.68 partners between age 5 and age 9, and the estimated partnership transitions is 0.56 (results not shown).

to assess whether selection into postconception cohabitation and other family types can explain any initial associations between family structure and child well-being. *Mother's race/ethnicity* is measured with a categorical variable that indicates whether she is white (referent), black, Hispanic, or some other race. Mother's and father's *age at birth* is measured with continuous variables for age at the time of the focal child's birth. Mother's and father's *education* at the child's birth is measured with categorical variables that indicate whether they had less than a high school education (referent), a high school diploma or GED, some college, or a college degree or graduate work. *Welfare receipt* is measured with a dichotomous variable that is coded "1" if the mother received public assistance in the year prior to the child's birth. Mother's cognitive ability is measured at the age 3 follow-up interview using a subset of the Similarities subtest of the Wechsler Adult Intelligence Scale – Revised (*WAIS-R*). Correct items are summed to create the overall score, with higher scores indicating higher cognitive ability. *Father's employment* at the time of the child's birth is measured with a categorical variable that indicates whether the father was unemployed (referent), worked 1-34 hours per week, 35-44 hours per week, or 45 or more hours per week. *Household income* in the year prior to the birth is measured in thousands of dollars. A dichotomous variable indicates whether the *child is male*. There is also a variable for the *child's age* at the time of assessment; this variable ranges from 2.5 to 11 years old, although most interviews were conducted when the children were approximately 3, 5, and 9 years old. A continuous variable indicates the number of *children under age 18 in the household* at the time of the focal child's birth. All control measures were collected at the baseline interview with the exception of child's age at assessment and the mother's cognitive test scores, which were not collected until the age 3 follow-up interview.

Supplemental analyses further adjust for the mother's *relationship status* at the time of

child assessment. A categorical variable indicates whether the mother was married to the child's biological father, married to another partner, cohabiting with the child's biological father (referent), cohabiting with another partner, or not married or cohabiting.

Analytic strategy

These analyses rely on Ordinary Least Squares (OLS) regressions to examine the relationship between postconception cohabitation and several metrics of child well-being, using clustered standard errors to account for the fact that data are pooled across the age 3, age 5, and age 9 assessments. In equation (1), Y_{it} is the child well-being outcome of child *i* at time *t*, the vector $RELATIONSHIP_{i0}$ represents a series of four variables that capture the mother's relationship status at the time of the focal child's birth (postconception cohabitation (referent), preconception cohabitation, postconception marriage, preconception marriage, not married/cohabiting), and the vector Z_{i0} represents a series of control variables measured at the child's birth (described above). Note that the models predicting household income and odds of welfare receipt also control for these measures in the year prior to the child's birth. This helps to isolate changes in the household's economic resources after the birth of the child.

$$Y_{it} = \alpha + \beta_{1\text{-}4}RELATIONSHIP_{i0} + \mathbf{Z}_{i0}\,\gamma_{5\text{-}24} + e_{it} \qquad (1)$$

These multivariate regressions provide insight into the relationship between family structure and child well-being, but there are some limitations to this approach. These models cannot support causal inference and can only estimate associations between family structure at birth and different metrics of child well-being. Although the models adjust for a rich set of background and demographic characteristics, they rely on the assumption that selection is fully captured by observable characteristics and are therefore susceptible to omitted variable bias. For example, if there are unobserved characteristics that are linked to both selection into family

structure and child well-being the estimates will be biased. Although fixed effects models are one possible alternative approach that could account for selection bias due to unobservable fixed characteristics, this type of model is not appropriate for the research question because the key independent variable-- relationship status at the time of birth-- does not vary over time. Therefore, OLS regressions are an appropriate approach for estimating non-causal associations between family structure at birth and child well-being.

RESULTS

Descriptive statistics

Descriptive statistics for the full sample are presented in Table 4.1. Five percent of mothers were in postconception cohabitations at the time of the focal child's birth, while 26% were cohabiting at the time of conception. Postconception marriages (2%) were less prevalent than postconception cohabitations, and 22% of mothers were married at the time of conception. Most mothers (45%) were not married or cohabiting at the time of the child's birth. Minorities are overrepresented in the sample; almost half of the mothers in the sample are Black, 26% are Hispanic and 22% are White. The sample is also skewed toward low-educated and low-income parents; about two thirds of mothers and fathers had a high school degree or less education at the time of the focal child's birth, and 36% of mothers reported receiving welfare benefits in the year before the child's birth.

Table 4.2 presents descriptive statistics by the biological parents' relationship status at birth. In this table, the asterisks indicate statistically significant differences from postconception cohabitors. Overall, parents in postconception and preconception cohabitations had similar characteristics in terms of race, welfare receipt, and father's education. They also had similar rates of relationship dissolution and romantic partner transitions. Compared to preconception

cohabitors, mothers in postconception cohabitations were slightly younger at the time of birth, had slightly more education, higher income in the year prior to the child's birth, and fewer children under age 18 in the household.

Postconception cohabitors were less advantaged than parents in pre- and postconception marriages overall. Compared to those who were married at the time of birth, mothers in postconception cohabitations were more likely to be ethnic or racial minorities and more likely to have received welfare benefits in the year before the child's birth. Postconception cohabitors were also younger at the time of birth, had less education, and lower household income. Fathers in postconception cohabitations had less education, were more likely to be unemployed, and were less involved with their children relative to fathers in pre- and postconception marriages. Postconception cohabitations were also more fragile than marriages, with more relationship dissolutions and romantic partner transitions.

Finally, postconception cohabitors were more advantaged compared to those who were not married or cohabiting with the biological father at the focal child's birth. Specifically, mothers in postconception cohabitations were less likely to have received welfare in the year before the child's birth, and had higher household income on average compared to mothers who were not married or cohabiting. Mothers in postconception cohabitations were more likely to be white or Hispanic and less likely to be black compared to unpartnered mothers. Fathers in postconception cohabitations had more education, were less likely to be unemployed, and more likely to work full-time compared to fathers who were not married or cohabiting. Fathers in postconception cohabitations were more involved with their children, and mothers experienced fewer romantic partner transitions compared to unpartnered parents.

Regression models

Table 4.3 summarizes the results from multivariate regressions predicting children's behavior problems, children's cognitive test scores, household economic resources, parenting behavior, and family stability. The regression coefficients for the relationship status variables present the average difference in child well-being relative to postconception cohabitors.

The first research question asks whether children born to postconception cohabitors fare better or worse compared to the children of preconception cohabitors. The results in Table 4.3 indicate that children of pre- and postconception cohabitors had similar development and household environments. There were no statistically significant differences in behavior problems, cognitive test scores, household economic resources, parenting behavior, and family stability. One exception is that mothers who began cohabiting prior to conception reported slightly less aggravation in parenting on average, although this coefficient is only marginally significant ($p < .10$). Also note that the R^2 statistic for this model is quite low, so the model explains only a small amount of variation in parenting aggravation. One potential explanation for higher levels of parenting aggravation among postconception cohabitors is that they may be more likely to have an unintended birth, which is associated with poorer parental psychological well-being and less support and communication between parents (Bronte-Tinkew et al. 2009; Su 2012). With the exception of this variation in parenting aggravation, the *timing* of the cohabitation relative to conception does not appear to be salient for child well-being.

The second research question compares well-being among children born to parents in postconception cohabitations and postconception marriages. The results were mixed. Results in Table 4.3 suggest that children born to parents in postconception cohabitations and postconception marriages experienced similar behavior problems. Surprisingly, children born to parents in postconception marriages had slightly lower PPVT scores on average compared to

children born to postconception cohabitors, after adjusting for background characteristics such as the parents' education and mother's cognitive ability. It is worth noting that the naïve model indicates that these children had statistically similar PPVT scores (see Appendix Table 4.1 or the difference in mean PPVT scores in Table 4.2). In a supplementary analysis in which I incrementally added controls (not shown), this negative association emerged after adjusting for mother's and father's education, child's age, and child's sex. Despite this small advantage in cognitive test scores, children born to postconception cohabiting parents experienced poorer household environments relative to children of postconception married parents. Mothers in postconception marriages had lower odds of welfare receipt, fewer romantic partner transitions, and lower odds of relationship dissolution compared to mothers in postconception cohabitations. In sum, the *type* of postconception relationship is associated with cognitive test scores, the mother's economic resources, and family stability, although marriage is not positively associated with all of these factors, contrary to preliminary hypotheses.

The third research question asks whether children born to postconception cohabitors fare worse than children born to parents in preconception marriages. Children born to preconception married parents demonstrated slightly less anxious behavior ($p < .10$), but similar aggressive behavior and PPVT scores. Preconception married parents had significantly higher household income ($5,682 more annual income, on average) and lower odds of welfare receipt. Children born to preconception married parents also experienced more father involvement and family stability relative to children of postconception cohabitors. These results suggest that preconception marriage is associated with a higher quality household environment and fewer child behavior problems compared to postconception cohabitations.

The fourth research question compares postconception cohabitation to families in which

the biological parents were not married or cohabiting at the time of birth, which is the most common arrangement for parents with nonmarital conceptions. These results suggest that postconception cohabitation is not associated with children's behavior problems or cognitive test scores relative to remaining unpartnered. Unpartnered parents did experience poorer household environments compared to postconception cohabitors, however. Specifically, unpartnered parents had lower household income, higher odds of welfare receipt, less father involvement, and more romantic partner transitions compared to postconception cohabitors. In sum, postconception cohabitation is associated with a higher quality household environment relative to parents who are unpartnered.

Sensitivity Tests

Recall that this study's conceptual model links relationship status at birth to child development and the household environment. To determine whether relationship status at birth has a unique association with these measures, I added controls for the mother's relationship status at the time of child assessment. The results are robust and yield similar findings (see Appendix Table 4.1). Although current relationship status is linked to the household environment and child development, relationship status at birth continues to have independent associations with these metrics of well-being. The R^2 statistics are quite similar compared to the original models, which suggests that current relationship status does not explain significantly more variation in the dependent variables.

Another sensitivity analysis limited the sample to mothers and first-born focal children. Sixty percent of mothers in the analytic sample had older biological children at the time of the focal child's birth; excluding them yields a sample of n= 3,249 person-year observations with first births. It is possible that a nonmarital pregnancy is a stronger motivation to form a

postconception relationship among first-time mothers, which is consistent with this study's theoretical assumptions. Parents who have older children were not motivated to start cohabiting by their previous pregnancies, which suggests that other factors may have prompted their relationship formation. Mothers with older children may have additional considerations in deciding whether to form a relationship, particularly if their older children have different fathers[8]. Mothers must consider their relationship with the older children's' biological father(s) as well as the relationship between the new partner and the older children. Additionally, fathers who form postconception cohabitations with mothers who have older children may have different characteristics than those who do not have any other children. From the perspective of the children, a child born to postconception cohabitors who have older children may be entering a family with biological siblings or a blended family with half-siblings, and this family composition may have implications for child well-being.

Appendix Table 4.6 summarizes the results of regressions predicting child development and household environment among the sample of first births. Results from the sample of first births yield the same general conclusions as the total sample, with a few caveats. The results relative to preconception cohabitors are consistent with one exception: the sample of first-born children indicates that preconception cohabitors had significantly lower income compared to postconception cohabitors, while the full sample indicates that they were statistically similar. The results relative to postconception married parents are also consistent, although the coefficient for PPVT scores no longer reaches the threshold of statistical significance in the sample of first births. Preconception married parents had statistically similar household income and odds of welfare receipt as children of postconception cohabitors in the sample of first births,

[8] At the age 1 interview, a little more than half of mothers who had older children at the time of the focal child's birth reported having children by someone other than the focal child's biological father. This gives some indication

while results from the total sample reached traditional thresholds of statistical significance indicating the preconception married parents had more economic resources.

Finally, I estimated models separately by survey wave to examine whether the relationship between family structure at birth and child development varies by age (results not shown). The results are substantively similar to the main models. One minor exception is that differences in parenting aggravation are more pronounced when children are younger; preconception cohabitors report less aggravation than postconception cohabitors at age 3 and age 5, but statistically similar aggravation at age 9.

DISCUSSION

Postconception cohabitation is an increasingly common response to nonmarital pregnancies (Lichter 2012; Rackin and Gibson-Davis 2012), yet little is known about how children fare in this type of family structure. The current study compliments a small but growing body of research on families with two biological cohabiting parents (Artis 2007; Brown 2004; Manning and Brown 2006), as well as demographic research on the growing trend of postconception cohabitation (Gibson-Davis and Rackin 2012; Lichter 2012; Rackin and Gibson-Davis 2012) by examining the relationship between postconception cohabitation and child well-being at age 3. Specifically, I evaluated the behavioral and cognitive development and household environment of children born to parents in postconception cohabitations relative to those born to parents in preconception cohabitations, parents in pre- or postconception marriages, and parents who were not married or cohabiting

Taken together, the evidence suggests that young children born to parents in postconception cohabitations experienced similar degrees of behavior problems and cognitive test scores compared to children in other family structures. These findings are contrary to the

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of the prevalence of multipartner fertility at the focal child's birth.

initial hypotheses, which posited that postconception cohabitation would be associated with poorer child development compared to preconception cohabitors and pre- and postconception marriages, but better development compared to unpartnered parents. Nevertheless, the findings are similar to prior research that found that children in two-parent-cohabiting families fared similarly as children in cohabiting step-families, married step-families, and single parents (Artis 2007; Brown 2004; Manning and Brown 2006) (although the current study evaluated family structure at birth rather than the current family structure).

Results from this study provide some indication about the relationship formation process and the meaning of cohabitation for the parents included in the sample. The first research question evaluated postconception cohabitation relative to preconception cohabitation, which speaks to the relevance of the *timing* of the cohabitation relative to conception for child well-being. Evidence suggests that the timing is not a relevant distinction in terms of child development, economic resources, and family stability. The initial hypothesis that preconception cohabitors would have more stable relationships than postconception cohabitors was not supported; pre- and postconception cohabitors experienced a similar number of romantic partner transitions and likelihood of relationship dissolution. This might suggest that postconception cohabitors make their relationship and fertility decisions jointly. In other words, the decision to enter into a postconception cohabitation might be framed as both a commitment to the parenting role and the partnership role.

The second research question evaluated whether the *type* of postconception relationship, marriage or cohabitation, was relevant for child well-being. This comparison provides some insight into the implications of the demographic and cultural shift away from postconception marriage in favor of postconception cohabitation. Results indicate that children born to

postconception cohabitors and postconception married parents had similar degrees of problem behavior, but children of postconception married parents had slightly lower cognitive test scores. This is somewhat surprising given prior research that associates marriage with better child development. Nonetheless, the current study revealed some important differences in the household environment of postconception cohabitors and postconception married parents, which suggest that cohabitation is still not equivalent to marriage. Postconception marriages were associated with lower odds of welfare receipt, fewer romantic partner transitions, and lower odds of relationship dissolution. It is not surprising that postconception marriages were more stable, given that marriage is a more institutionalized family structure that is reinforced by legal and social norms (Cherlin 2004).

The third and fourth research questions evaluated postconception cohabitation relative to preconception marriage and unpartnered parents, respectively. Although children born to preconception married parents had access to greater financial resources, more father involvement, and more family stability, results suggested that they had similar degrees of anxious behavior problems and cognitive test scores as children of postconception cohabitors. In the same vein, children born to unpartnered parents had similar behavior problems and cognitive test scores compared to children born to postconception cohabitors, despite having fewer economic resources, less father involvement, and less family stability. These findings are contrary to the initial hypotheses, which posited that children born to postconception cohabitors would fare worse than those born to married parents, but better than those born to unpartnered parents.

These results suggest that the shift from postconception marriage to postconception cohabitation may not have broader consequences in terms of child development, at least among

this study's largely racial and ethnic minority sample of young children. Why is postconception cohabitation unrelated to children's behavioral and cognitive development relative to other family structures, despite being associated with increased family instability, a risk factor for poor developmental outcomes? One potential explanation is related to the fact that cohabitation is an increasingly normative context for childrearing. As cohabitation has become more common, norms about the "legitimation" of nonmarital births have relaxed, as reflected by the decline in postconception marriage and the concomitant increase in postconception cohabitation. Perhaps parents who are likely to form postconception cohabitations today would have been more likely to enter into postconception marriages when social norms about marriage were more stringent.

Another potential explanation is related to this study's large racial and ethnic minority sample. Although prior research links family instability to poorer developmental outcomes for children overall, there is evidence that the effect may vary by race (Cavanagh and Huston 2006; Fomby and Cherlin 2007). Specifically, family structure transitions were associated with poorer well-being for white children, but not for black children (Fomby and Cherlin 2007). Given that 40% of postconception cohabitors in the current study's sample are Black and 34% are Hispanic, it is possible that racial differences in the relationship between family instability and child well-being can explain why postconception cohabitation is not associated with children's behavioral and cognitive development. Because increases in postconception cohabitation are concentrated among racial and ethnic minorities, acknowledging racial variation in the relationship between family structure and child development is crucial to understanding the implications of this shift.

Finally, it's possible that differences in economic resources and family stability between postconception cohabitors and postconception married parents may have longer term implications for children's behavioral and cognitive development that have not yet emerged

among the current study's sample of 3-11 year old children. Future research on an older adolescent and young adult sample might be able to further interrogate the longer term implications of postconception married and postconception cohabiting family environments.

This study has several limitations that merit attention. Although the analyses draw on rich, longitudinal data that provide a unique opportunity to examine postconception cohabitation and child well-being, the sample is not nationally representative. The Fragile Families study is a birth cohort study designed to be representative of children born between 1998-2000 in large cities with populations of 200,000 or more when weighted with sampling weights. The current study draws on measures from the in-home component of the survey, however, and the Fragile Families study does not provide sampling weights that account for the additional attrition in this survey. The results should therefore not be generalized to a national population, and the demographic composition of the sample should contextualize the findings. Nonetheless, this sample provides a unique opportunity to examine the implications of postconception cohabitation among the population that has seen the most growth in this type of family structure. Finally, it is possible that cohabitation rates are underestimated in the sample, which provides a conservative estimate of the relationship between postconception cohabitation and makes the results susceptible to type II error (failure to reject a false null hypothesis).

This study sheds light on the relationship between postconception cohabitation, child well-being, and household characteristics, but also highlights avenues for future research. Although the current study suggests that children born to postconception cohabitors experience similar behavioral and cognitive development as children in other family structures, on average, it does not address whether these arrangements have varying effects by race/ethnicity or socioeconomic status. For example, it is possible that postconception cohabitation is associated

with poorer well-being than postconception marriage among relatively disadvantaged children, but not more affluent children. Research finds that the shift from postconception marriages to postconception cohabitations is driven by low-educated women and hypothesizes that this dynamic might reinforce inequality among disadvantaged children (Gibson-Davis and Rackin 2012). Future research should evaluate whether the link between postconception cohabitation and child well-being varies by education or socioeconomic status to shed light on the implications of this stratification.

As more couples choose to cohabit in response to a nonmarital pregnancy, it is important to understand the implications of this family structure for children. Given that growth in postconception cohabitation is concentrated among low-educated mothers and racial/ethnic minorities, it is possible that this demographic shift could reinforce the inequalities of children born into different social classes. Results from this study suggest that the shift toward postconception cohabitation may not have consequences for children's behavioral and cognitive development, at least among the large racial and ethnic minority sample evaluated in this study. This does not imply that postconception cohabitation is an ideal family structure, however. Children born to postconception cohabitors experience fewer economic resources, less father involvement, and more family instability compared to married parents. These characteristics may further compound the relative disadvantage of children born to unmarried parents.

Table 4.1. Demographic and family characteristics for total sample

Variable	Person-Year Obs	Mean or %	Std. Dev.
Parents' relationship status at birth			
Postconception cohabitation	8218	0.05	
Preconception cohabitation	8218	0.26	
Postconception marriage	8218	0.02	
Preconception marriage	8218	0.22	
Not married/cohabiting	8218	0.45	
Mother's race			
White	8218	0.22	
Black	8218	0.49	
Hispanic	8218	0.26	
"Other" race	8218	0.03	
Mother's age at birth	8218	25.15	6.00
Mother's education at birth			
Less than high school	8218	0.32	
High school/GED	8218	0.31	
Some college	8218	0.26	
College or more	8218	0.11	
Welfare receipt (year before birth)	8218	0.36	
Mother's WAIS-R score	8218	6.83	2.66
Father's age at birth	8218	27.43	7.01
Father's education at birth			
Less than high school	8218	0.32	
High school/GED	8218	0.37	
Some college	8218	0.21	
College or more	8218	0.11	
Father's employment at birth			
Unemployed	8218	0.13	
Works 1-34 hours/week	8218	0.16	
Works 35-44 hours/week	8218	0.38	
Works 45+ hours/week	8218	0.32	
Child is male	8218	0.52	
Child's age at assessment	8208	5.85	2.72
HH income (year before birth)	8218	32.71	31.87
Kids <18 in HH	8218	1.25	1.31

Table 1. (continued)

Current relationship status (measured at child assessment)			
Mother married to bio dad	8119	0.32	
Mother married to partner (not bio dad)	8119	0.05	
Mother cohabits with bio dad	8119	0.15	
Mother cohabits with partner (not bio dad)	8119	0.10	
Mother is not married or cohabiting	8119	0.37	
Dependent variables (measured at child assessment)			
Child's aggressive behavior	8095	0.47	0.37
Child's anxious behavior	8136	0.32	0.29
Child's PPVT score	6830	91.16	16.20
HH income	8208	40.34	47.35
Welfare receipt	8218	0.28	
Aggravation in Parenting	8207	2.16	0.68
Father involvement	8208	3.39	1.72
Parents' union dissolved (among married/cohabiting at birth)	4524	0.35	
Number of romantic partner transitions	8208	1.20	1.48

Table 4.2. Demographic and family characteristics by mother's relationship status at birth

	Postconception cohabitation			Preconception cohabitation			
Variable	Person-Year Obs	Mean	Std. Dev.	Person-Year Obs	Mean	Std. Dev.	
Mother's race							
White	385	0.23		2150	0.19		†
Black	385	0.40		2150	0.44		
Hispanic	385	0.34		2150	0.34		
"Other" race	385	0.03		2150	0.03		
Mother's age at birth	385	22.20	4.14	2150	24.67	5.61	***
Mother's education at birth							
Less than high school	385	0.38		2150	0.37		
High school/GED	385	0.28		2150	0.35		**
Some college	385	0.31		2150	0.25		*
College or more	385	0.03		2150	0.03		
Welfare receipt (year before birth)	385	0.40		2137	0.41		
Mother's WAIS-R score	385	6.97	2.32	2150	6.49	2.62	**
Father's age at birth	385	24.41	5.97	2150	27.17	6.70	***
Father's education at birth							
Less than high school	385	0.35		2150	0.37		
High school/GED	385	0.37		2150	0.39		
Some college	385	0.23		2150	0.21		
College or more	385	0.06		2150	0.03		*
Father's employment at birth							
Unemployed	385	0.12		2150	0.13		
Works 1-34 hours/week	385	0.13		2150	0.09		*
Works 35-44 hours/week	385	0.46		2150	0.43		
Works 45+ hours/week	385	0.29		2150	0.34		*
Child is male	385	0.49		2150	0.49		
Child's age at assessment	385	5.71	2.68	21440	5.85	2.74	
HH income (year before birth)	385	30.93	27.23	2150	26.62	23.09	**
Kids <18 in HH	385	0.79	1.04	2150	1.24	1.30	***
Current relationship status (measured at child assessment)							
Mother married to bio dad	383	0.26		2115	0.25		
Mother married to partner (not bio dad)	383	0.03		2115	0.04		
Mother cohabits with bio dad	383	0.27		2115	0.31		
Mother cohabits with partner (not bio dad)	383	0.09		2115	0.09		
Mother is not married or cohabiting	383	0.35		2115	0.31		
Dependent variables (measured at child assessment)							
Child's aggressive behavior	381	0.48	0.36	2111	0.47	0.37	
Child's anxious behavior	385	0.33	0.29	2121	0.33	0.30	
Child's PPVT score	316	91.92	14.83	1785	89.46	15.45	**
HH income	385	37.19	29.52	2144	32.62	27.42	**
Welfare receipt	385	0.23		2150	0.28		

Aggravation in Parenting	385	2.18	0.65	2144	2.12	0.68	†
Father involvement	385	3.81	1.52	2144	3.72	1.59	
Parents' union dissolved (among married/cohabiting at birth)	384	0.51		2133	0.50		
Number of romantic partner transitions	385	1.04	1.31	2144	1.01	1.42	

Asterisks indicate statistically significant difference from postconception cohabitation

**** p<0.001, ** p<0.01, * p<0.05, † p<0.10*

Table 4.2. Demographic and family characteristics by mother's relationship status at birth (continued)

	Postconception marriage				Preconception marriage				Not married/cohabiting			
Variable	Person-Year Obs	Mean	Std. Dev.		Person-Year Obs	Mean	Std. Dev.		Person-Year Obs	Mean	Std. Dev.	
Mother's race												
White	177	0.29			1837	0.48		***	3669	0.11		***
Black	177	0.29		*	1837	0.24		***	3669	0.66		***
Hispanic	177	0.29			1837	0.22		***	3669	0.21		***
"Other" race	177	0.14		***	1837	0.06		*	3669	0.02		
Mother's age at birth	177	25.33	5.83	***	1837	29.63	5.38	***	3669	23.49	5.52	***
Mother's education at birth												
Less than high school	177	0.14		***	1837	0.14		***	3669	0.38		
High school/GED	177	0.23			1837	0.18		***	3669	0.35		**
Some college	177	0.39		†	1837	0.29			3669	0.23		**
College or more	177	0.25		***	1837	0.39		***	3669	0.03		
Welfare receipt	177	0.22		***	1837	0.09		***	3669	0.47		**
Mother's WAIS-R score	177	7.96	2.66	***	1837	7.84	2.79	***	3669	6.45	2.50	***
Father's age at birth	177	26.92	6.09	***	1837	31.91	6.24	***	3669	25.68	6.68	***
Father's education at birth												
Less than high school	177	0.15		***	1837	0.15		***	3669	0.37		
High school/GED	177	0.37			1837	0.22		***	3669	0.43		*
Some college	177	0.33		*	1837	0.28		*	3669	0.17		**
College or more	177	0.16		***	1837	0.35		***	3669	0.03		***
Father's employment at birth												
Unemployed	177	0.07		†	1837	0.04		***	3669	0.18		**
Works 1-34 hours/week	177	0.08			1837	0.07		**	3669	0.25		***
Works 35-44 hours/week	177	0.45			1837	0.41		†	3669	0.32		***
Works 45+ hours/week	177	0.39		*	1837	0.48		***	3669	0.23		*
Child is male	177	0.43			1837	0.55		*	3669	0.54		
Child's age at assessment	177	5.91	2.76		1837	5.75	2.71		3665	5.91	2.71	
HH income (year before birth)	177	47.96	35.21	***	1837	60.43	40.90	***	3669	21.84	21.24	***
Kids <18 in HH	177	0.62	0.93	†	1837	1.11	1.19	***	3669	1.41	1.38	***

Table 4.2. Demographic and family characteristics by mother's relationship status at birth (continued)

	Postconception marriage				Preconception marriage				Not married/cohabiting			
Variable	Person-Year Obs	Mean	Std. Dev.		Person-Year Obs	Mean	Std. Dev.		Person-Year Obs	Mean	Std. Dev.	
Current relationship status (measured at child assessment)												
Mother married to bio dad	177	0.73		***	1828	0.85		***	3616	0.09		***
Mother married to partner (not bio dad)	177	0.05			1828	0.03			3616	0.06		**
Mother cohabits with bio dad	177	0.00		***	1828	0.00		***	3616	0.13		***
Mother cohabits with partner (not bio dad)	177	0.03		*	1828	0.02		***	3616	0.16		***
Mother is not married or cohabiting	177	0.19		***	1828	0.10		***	3616	0.56		***
Dependent variables (measured at child assessment)												
Child's aggressive behavior	175	0.44	0.36		1816	0.39	0.32	***	3612	0.50	0.39	
Child's anxious behavior	175	0.28	0.23	†	1821	0.27	0.25	***	3634	0.33	0.31	
Child's PPVT score	142	94.16	15.01		1428	98.86	17.43	***	3159	88.42	15.06	***
HH income	177	63.06	64.60	***	1837	77.14	73.94	***	3665	25.64	24.33	***
Welfare receipt	177	0.11		***	1837	0.07		***	3669	0.40		***
Aggravation in Parenting	177	2.13	0.62		1836	2.12	0.64		3665	2.20	0.71	
Father involvement	177	4.17	1.36	**	1837	4.41	1.15	***	3665	2.60	1.70	***
Parents' union dissolved (among married/cohabiting at birth)	177	0.31		***	1830	0.16		***	--	--	--	
Number of romantic partner transitions	177	0.53	0.93	***	1837	0.32	0.85	***	3665	1.79	1.54	***

Asterisks indicate statistically significant difference from postconception cohabitation

**** p<0.001, ** p<0.01, * p<0.05, † p<0.10*

Table 4.3. Summary of regression results predicting child's behavior problems, child's cognitive test scores, economic resources, parenting behavior, and family stability

	Child's aggressive behavior	Child's anxious behavior	Child's PPVT score	Household income	Welfare receipt	Aggra-vation in parenting	Father involve-ment	Romantic partner transitions	Relation-ship Dissolved [1]
Variable	*β (SE)*	*β (SE)*	*β (SE)*	*β (SE)*	*OR (SE)*	*β (SE)*	*β (SE)*	*β (SE)*	*OR (SE)*
Postconception cohabitation at birth (referent)									
Preconception cohabitation at birth	0.007	0.005	-1.485	-1.557	1.104	-0.082†	-0.097	0.011	0.956
	(0.023)	(0.017)	(1.086)	(1.780)	(0.186)	(0.047)	(0.111)	(0.105)	(0.171)
Postconception marriage at birth	0.008	-0.023	-3.664*	5.363	0.593†	-0.020	0.204	-0.353**	0.571†
	(0.039)	(0.025)	(1.661)	(4.647)	(0.184)	(0.076)	(0.166)	(0.131)	(0.174)
Preconception marriage at birth	-0.028	-0.032†	-1.468	5.682**	0.612**	-0.058	0.266*	-0.334**	0.360***
	(0.025)	(0.018)	(1.204)	(2.104)	(0.117)	(0.050)	(0.115)	(0.107)	(0.073)
Not married/cohabiting at birth	0.029	0.012	-1.036	-4.267*	1.474*	-0.018	-1.068***	0.624***	--
	(0.023)	(0.017)	(1.059)	(1.749)	(0.243)	(0.045)	(0.110)	(0.103)	--
Observations	8,088	8,129	6,820	8,208	8,208	8,207	8,208	8,208	4,522
Adjusted R^2/Pseudo R^2	0.247	0.217	0.245	0.438	0.219	0.037	0.225	0.255	0.193

Note. All models control for mother's race, mother's age at birth, mother's education, mother's welfare receipt in the year before birth, mother's cognitive ability, father's age at birth, father's education, father's employment, child's sex, child's age at assessment, household income in the year before birth, and number of children under age 18 in the household. OR = Odds Ratio

Robust standard errors in parentheses

[1] Among respondents married or cohabiting at child's birth.

**** p<0.001, ** p<0.01, * p<0.05, † p<0.10*

Appendix Table 4.1. Summary of regression results predicting child's behavior problems, child's cognitive test scores, economic resources and parenting behavior, controlling for current relationship status

Variable	Child's aggressive behavior *β*	Child's anxious behavior *β*	Child's PPVT score *β*	Household income *β*	Welfare receipt *OR*	Aggravation in parenting *β*	Father involvement *β*
Relationship status at birth							
Postconception cohabitation at birth (referent)							
Preconception cohabitation at birth	0.006	0.003	-1.475	-1.975	1.087	-0.083†	-0.114
	(0.023)	(0.017)	(1.076)	(1.704)	(0.184)	(0.047)	(0.075)
Postconception marriage at birth	0.018	-0.015	-4.576**	1.634	0.758	-0.007	-0.099
	(0.039)	(0.025)	(1.677)	(4.497)	(0.238)	(0.076)	(0.108)
Preconception marriage at birth	-0.015	-0.022	-2.521*	1.049	0.825	-0.040	-0.184*
	(0.025)	(0.018)	(1.227)	(2.122)	(0.162)	(0.052)	(0.080)
Not married/cohabiting at birth	0.021	0.010	-1.052	-1.798	1.339†	-0.041	-0.434***
	(0.023)	(0.017)	(1.053)	(1.689)	(0.222)	(0.046)	(0.077)
Current relationship status							
Cohabiting with bio dad (referent)							
Married to bio dad	-0.021	-0.028*	2.723***	5.113***	0.582***	-0.010	-0.073†
	(0.016)	(0.012)	(0.715)	(1.284)	(0.067)	(0.032)	(0.038)
Married to partner (not bio dad)	0.005	-0.001	0.411	5.281**	0.927	0.028	-2.885***
	(0.021)	(0.017)	(0.972)	(2.045)	(0.137)	(0.045)	(0.071)
Cohabiting with partner (not bio dad)	0.018	-0.025†	1.593*	-3.451**	1.371**	0.080*	-2.730***
	(0.018)	(0.013)	(0.775)	(1.195)	(0.157)	(0.035)	(0.055)
Not married/cohabiting at birth	0.018	-0.010	1.220*	-10.031***	1.256*	0.080**	-2.263***
	(0.014)	(0.011)	(0.609)	(0.934)	(0.114)	(0.028)	(0.043)
Observations	8,001	8,043	6,736	8,119	8,119	8,118	8,119
Adjusted R^2/Pseudo R^2	0.247	0.218	0.248	0.453	0.226	0.0392	0.565

Note. All models control for mother's race, mother's age at birth, mother's education, mother's welfare receipt in the year before birth, mother's cognitive ability, father's age at birth, father's education, father's employment, child's sex, child's age at assessment, household income in the year before birth, and number of children under age 18 in the household. OR = Odds Ratio

Robust standard errors in parentheses; *** *p<0.001,* ** *p<0.01,* * *p<0.05,* † *p<0.10*

Appendix Table 4.2. Summary of regression results predicting child's behavior problems, child's cognitive test scores, economic resources, parenting behavior, and family stability, among first-born children

Variable	Child's aggressive behavior *β*	Child's anxious behavior *β*	Child's PPVT score *β*	Household income *β*	Welfare receipt *OR*	Aggravation in parenting *β*	Father involvement *β*	Romantic partner transitions *β*	Relationship Dissolved [1] *OR*
Postconception cohabitation at birth (referent)									
Preconception cohabitation at birth	-0.017	0.012	-1.224	-5.297*	1.077	-0.136*	-0.061	-0.022	0.873
	(0.032)	(0.024)	(1.478)	(2.459)	(0.285)	(0.059)	(0.161)	(0.159)	(0.211)
Postconception marriage at birth	-0.048	-0.037	-2.610	1.998	0.521	-0.039	0.223	-0.460*	0.478†
	(0.051)	(0.034)	(2.168)	(5.770)	(0.241)	(0.094)	(0.233)	(0.186)	(0.190)
Preconception marriage at birth	-0.052	-0.024	-1.569	2.523	0.549	-0.084	0.303†	-0.426**	0.270***
	(0.035)	(0.028)	(1.789)	(3.193)	(0.219)	(0.068)	(0.174)	(0.164)	(0.081)
Not married/cohabiting at birth	-0.010	0.008	-0.232	-6.851**	1.724*	-0.088	-1.064***	0.452**	--
	(0.031)	(0.023)	(1.412)	(2.390)	(0.438)	(0.056)	(0.158)	(0.150)	--
Observations	3,219	3,236	2,695	3,267	3,267	3,267	3,267	3,267	1,634
Adjusted R^2/Pseudo R^2	0.257	0.198	0.271	0.414	0.201	0.039	0.240	0.248	0.197

Note. All models control for mother's race, mother's age at birth, mother's education, mother's welfare receipt in the year before birth, mother's cognitive ability, father's age at birth, father's education, father's employment, child's sex, child's age at assessment, household income in the year before birth, and number of children under age 18 in the household. OR = Odds Ratio

Robust standard errors in parentheses

[1] Among respondents married or cohabiting at child's birth.

*** $p<0.001$, ** $p<0.01$, * $p<0.05$, † $p<0.10$

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